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R v. 10-11

520 Miles New Road Work and 30 Bridges

For 1932

Highway Division Program Includes All Phases of Construction in Every Part of the State

By COLONEL WALTER E. GARRISON, Director of Public Works

THE PLANS for highway construction as formulated by the Division of Highways for 1932 will advance the improvement of State roads in all sections of California. This year will see a substantial addition to the improved mileage. Communities in every part of our large Pacific commonwealth will be brought closer together and the State as a whole welded into a more compact unit.

It is the State highway system which makes possible this ready communication, both social and commercial, between North and South, Sierra and Seaboard, Desert and Metropolis. To this end the Division of Highways with its orderly ten-year program, is steadily bringing toward fulfillment a comprehensive system of thoroughfares designed to meet the needs of the various parts of the State and to provide the entire motoring public with adequate lanes of travel—highways adequate not only in length and number, but also adequate in width, thickness, alignment and grade, to bear safely the load of modern and future traffic.

COVERS WHOLE FIELD

Improvements to the State highways during the year just begun will include all phases of road work: construction on new or revised alignment; reconstruction of existing roads to modern standards of engineering requirements and constant maintenance of the entire system.

The construction of highways will include work on both primary and secondary routes, advancing improvements into new territories on routes now partially constructed and commencing work on other roads which were added to the State system by the last Legislature.

The reconstruction program involves the widening, straightening, surfacing and paving of existing State roads, that they may carry their traffic loads safely and swiftly.

The maintenance program is insurance that the people's investment in highways will be

preserved and this work is carried on constantly, keeping the highways in repair and preserving the capital investment made in every county of the State.

MILEAGE INVOLVED

Construction and reconstruction programs to be commenced in 1932, as set up in the Governor's budget, or provided for by the California Highway Commission during 1931, are estimated to approximate \$23,000,000. This work will include the placing of some 410 miles of the various types of paving and 60 miles of bituminous treated and untreated crushed rock surfacing, the construction of about 50 miles of graded and drained roadbed and the construction of 30 bridges and grade separations.

The amount allocated for maintenance during the year throughout the entire State will be approximately \$6,000,000.

To provide a picture of more definite outline for the coming year, brief descriptions of some of the larger projects which will be put under way during 1932 are given herewith.

OUTSTANDING PROJECTS

In southern California the outstanding projects will include the following:

On the important trancontinental highway which enters California at Yuma the last gap in the modern pavement will be closed with the placing of nine miles of asphalt concrete over the existing bituminous treated crushed rock surfacing, between the Sand Hills and five miles west of Yuma in Imperial County. The proposed work will connect the recently completed pavements between Yuma and Araz and from Holtville to Sand Hills.

This construction will give a modern 20-foot pavement over this entry into California from the Colorado River to El Centro.

On the portion of this interstate route between El Centro and San Diego a wide pavement built to high standards is rapidly nearing completion. On December 30th last

State Snow Fighters Win Victory on Far-Flung Sierra Battle Line

By A. L. BANKS, Assistant Deputy Director of Public Works

MEN of the highway division are on a far-flung battle line this winter. The Storm King and the Snow Queen began an offensive a few days before Christmas. The maintenance men accepted the challenge. With small arms, with great tanks and much grit, they went into action. The left of the battle line rested by the swirling freshets along the coast; the right was near the snow draped peaks of the Sierras; the center held the line of communications in the valley.

Hard fighting highway men plowed through the best the storm had to give. They opened the Victory highway. They will keep it open, save for brief intervals after new storms. Traffic will roll on rubber over dry pavement across the Sierras.

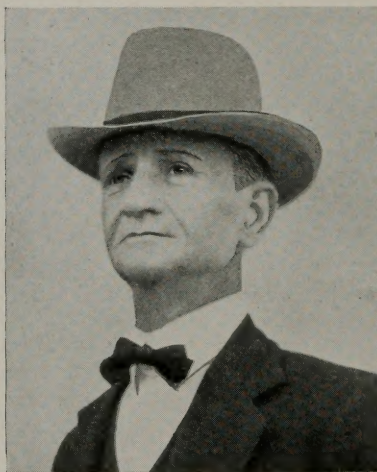
With more than 200 inches of snow at high points around Soda Springs and an equal depth spread over the upper sections of the Donner Pass road, the fight was made and won over three weeks ago. There have been some brief intermissions caused by storms and slides but for more than three-quarters of the time there has been dry pavement.

Superintendent Weeks and Assistant Bohrmann and their sturdy buck privates, acting under the orders of T. H. Dennis, Maintenance Engineer of the Division of Highways, cut the enemy's line wide open. They took back the people's property. The manner in which the big rotary plow mowed the snow banks and tossed the "beautiful" far out of the way was a sight to behold. The spectacle was worth a day's travel. The snow was thrown overbank with a force that suggested an old hydraulic mining hose in action.

The machine was shut down only for fuel and oil. Twenty-four hours every day, in sunshine and in blizzard, it dug, plowed and excavated. When a crew's time was up there was another on hand to take the work over. In the inky dark, working its own lights,

the rotary machine crawled through drifts.

The awesome silence of the mountain nights, was broken by the roar of its engines and the clanking of its mechanism. To the watcher it became a wonder how the drivers could "pick the road." In places there was nothing to mark the way but the clearing through the trees. But they knew how. They did it. There was no fumble. The machine was put right where it was needed, and then it dug and dug—leaving great lines of snow on both sides and a hard pavement between the white embankments.



A. L. BANKS

On the Red Bluff-Susanville lateral the same fight was made and won. The grades there are less exposed to drifts, and the highway, as a rule, makes machine operation easier. But it required quick work, hard work, day and night work, just the same. Here, as elsewhere, the Sierras had not received such a snow in twenty years.

In reality it was the first time since the State threw its modern highway through the big hills that the question of the open road was forced squarely up to the highway department. It declared for the open road. Superintendent Gribble has been able to keep cars rolling via Susanville, and his heaviest tool was a shovel of the tractor type.

It has been a remarkable achievement to open these roads, particularly the Donner Pass road. To see business and pleasure traffic rolling through tunnels of snow makes a picture beyond the register of a camera.

The men are continually on the alert for slides, storms and obstructions. The roads are patrolled and the machinery is moved rapidly to points where it is needed. Control stations require cars to wear chains, and drivers are advised as to the conditions to be encountered.

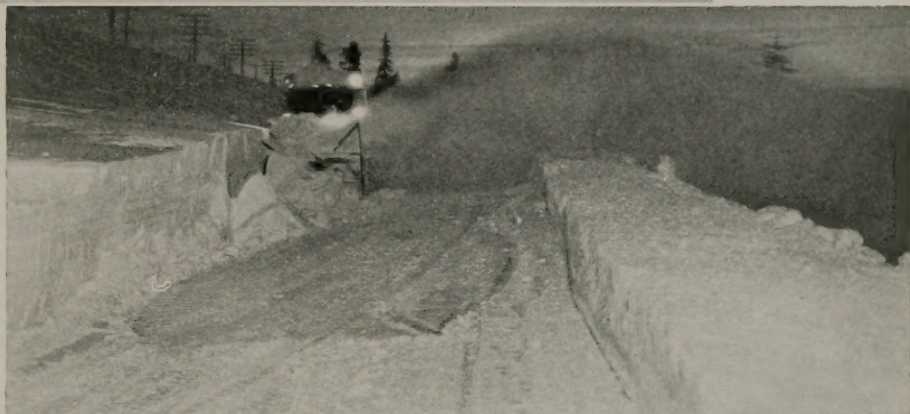
Any Californian going into the mountains and seeing what has and is being done, is made to feel proud of maintenance division.

(Continued on page 4)



"SO HIGH!"—
The men are thus illustrating the height of a big drift on Donner Pass some three miles west of Soda Springs before the big snow plows finished clearing the road.

Through the night while the Storm King howls in fiendish glee as he hurls icy blasts piling great drifts across their paths the highway crews work doggedly on keeping the plows going 24 hours a day, stopping only for fuel and oil.



Black and White—a broad ribbon of clean black road threading its way for miles between high white walls over snow clad mountains—that's the Auburn-Truckee road shown here a few miles east of Applegate.

Far-flung frontiers like the Red Bluff-Susanville lateral are valorously defended against the onslaughts of the snow storms by maintenance crews who keep a fine two-way lane continuously open for traffic.



Victory Rests With State Snow Crews on Sierra Highways

(Continued from page 2)

T. H. Dennis, State Maintenance Engineer, is in line for ski jumping. Early this month a new storm closed the road below Soda Springs. Mr. Dennis took F. E. Burnside with him to the end of the trail. From there he sent his machine back. The two men donned snow shoes and hoofed it three miles over a tough country and into Soda Springs.

Traffic to and from California can now pass over its highways. The Sierras and snow no longer bar the automobile on the Victory highway. True, it will be an all winter campaign to hold the line, but Mr. Dennis' men are on the job. Both business and romance have a share of interest in the achievement. But to the maintenance men it is only another tough job accomplished, another day's work well done.

SNOW REMOVAL WORK JUSTIFIED BY RESULTS

Mr. C. H. Purcell,
California State Highway Engineer,
Public Works Building,
Sacramento, California.

Dear Mr. Purcell:

We want to compliment you and your organization for the splendid snow removal work which you have been and are now doing in keeping the highways of California open.

This has been an exceptionally bad season and there have been but very few intermittent times during which any of the main highways have been closed. The amount of travel using these thoroughfares and the hundreds of inquiries which we are receiving indicates there is no doubt of the justification of your efforts. I am sure the motoring public appreciates your work.

A continuance of the building of highways on proper alignment and the further development of snow removal equipment, coupled with an increased demand on the part of the motoring public, all indicate that within the very near future there will be no trouble in keeping all our interstate routes open at all times, regardless of the quantity of snow.

Respectfully yours,

C. C. COTTRELL,
Manager, Highways Bureau,
California State Automobile Association.

Feather River Span Vaults Over Gorge, Stream and Railroad

By WALTER A. DOUGLASS, Assistant Bridge
Construction Engineer

WHEN the Legislature enacted the law extending the primary road system of the State to reach all county seats, a very considerable but interesting task was imposed on the Division of Highways. For the past three and one-half years the completion of these roads has been an important objective of the Division.

One of the most spectacular and costly pieces of construction in this group of new highways is that section of State Route No. 21, extending from Oroville to Quincy, the county seat of Plumas County. For the greater part of this stretch the new highway follows closely to a water grade along the Feather River Canyon and from one to three hundred feet above the normal water level. The obvious difficulties and cost of construction are further increased by the necessity of an occasional crossing.

DIFFICULT TASK

Near the railroad station at Pulga, about thirty miles above Oroville, the second crossing is being constructed—a steel arch bridge joining the rock cliffs of the canyon sides. All loose material was removed and footings and anchors set well into the solid rock of the precipitous cliffs for the concrete abutments which provide the main supports for the bridge. The steel arch which spans over both the river and a railroad bridge is 350 feet long. Shorter steel spans on either end bring the total length of the bridge to 680 feet.

While the length even for the clear span of 350 feet is not particularly notable, some of the hazards and difficulties of construction may be readily imagined when it is realized that surveyors descended the face of the cliffs on ropes to set stakes for the abutments. The deck of the highway bridge is some 200 feet above the river and 170 feet above the tracks of the Western Pacific Railroad, which crosses the river in the opposite direction at the same point.

Steel members for the structure were transported and placed in position by means of a wire rope high-line over the bridge. Construction of the center span began at the cast-steel shoes on either abutment and was carried out to a meeting at the crown pin of the arch.

STOPPED BY WEATHER

The ordinary difficulties of this type of construction were very considerably magnified by the high velocity winds characteristic of the Feather River Canyon.

Due to the snow—much in evidence in the accompanying photograph—and general unfavorable weather, the contractor discontinued operations when the steel erection was completed late in December and will return in March or April to place the concrete deck and steel railing and apply the aluminum paint to the steel.

When completed, this bridge will have cost approximately \$170,000. It will form a link in a new highway making easily accessible one of the most beautiful and enjoyable vacation lands in a State widely celebrated for such natural advantages.

"Have you ever driven a car?" the lady applicant for a license was asked.

"One hundred and twenty thousand miles," put in her husband, "and never had her hand on the wheel."



A DIZZY LEAP will be made by the State highway up the Feather River Canyon when it crosses the gorge over this bridge now under construction at Pulga. The top picture shows the graceful arch springing from one precipitious canyon wall to the other high above the rushing stream and a railroad bridge crossing in the opposite direction. The steel arch spanning both river and railroad is 350 feet long, while the total length of the bridge is 680 feet. The highway will thus be carried over at a height of 200 feet above the river and 170 feet above the railroad bridge. The lower picture shows the bridge in its present state of construction and gives a close-up of the anchorage in one side of the sheer canyon gorge.

Transbay Bridge Tunnel Unit to be World's Largest Cross-Section Bore

By C. H. PURCELL, Chief Engineer of San Francisco-Oakland Bridge.

WORK ON the design of the San Francisco-Oakland Bay Bridge is rapidly progressing. During the past month two contracts were awarded for essential drillings to determine the strength of foundations for the tunnel link and pier anchorages of the bridge and for the San Francisco approaches.

Work to determine the foundation strength for the San Francisco approach is now under way. Forty holes will be sunk to a depth of 25 feet into bedrock or 100 feet below the earth's surface. Borings are being made in the district from the Embarcadero to and including Sixth Street on Mission, Minna, Howard, Folsom, Harrison, and Bryant streets.

Crews are now engaged in taking sample borings for the tunnel foundations on Yerba Buena Island. A tunnel through this island is estimated to cost, according to present plan, approximately \$1,000,000.

It will be a two-deck structure approximately 500 feet in length, 70 feet wide, and 50 feet high. Six lines for fast motor traffic will utilize the upper deck. Three lines of roadway will be provided for trucks and slow moving vehicles, and two inter-urban tracks on the lower deck. Foundation borings for the tunnel will cost \$7,275 and for the San Francisco Approach drillings, \$18,500.

Presents New Problems

The problems encountered by engineers engaged in the development of a project of such magnitude are many and often difficult to efficiently and economically solve.

The San Francisco-Oakland Bay Bridge presents many problems not ordinarily encountered in large bridge projects; in fact, a considerable number which have never before presented themselves. This project is unprecedented in at least two general phases.

No other bridge has spanned so wide an expanse of major navigable water. It is nearly 9000 feet from the bulkhead line in San Francisco to the shore of Yerba Buena Island, and the depth to rock foundations over this wide channel varies from 100 to 230 feet below water.

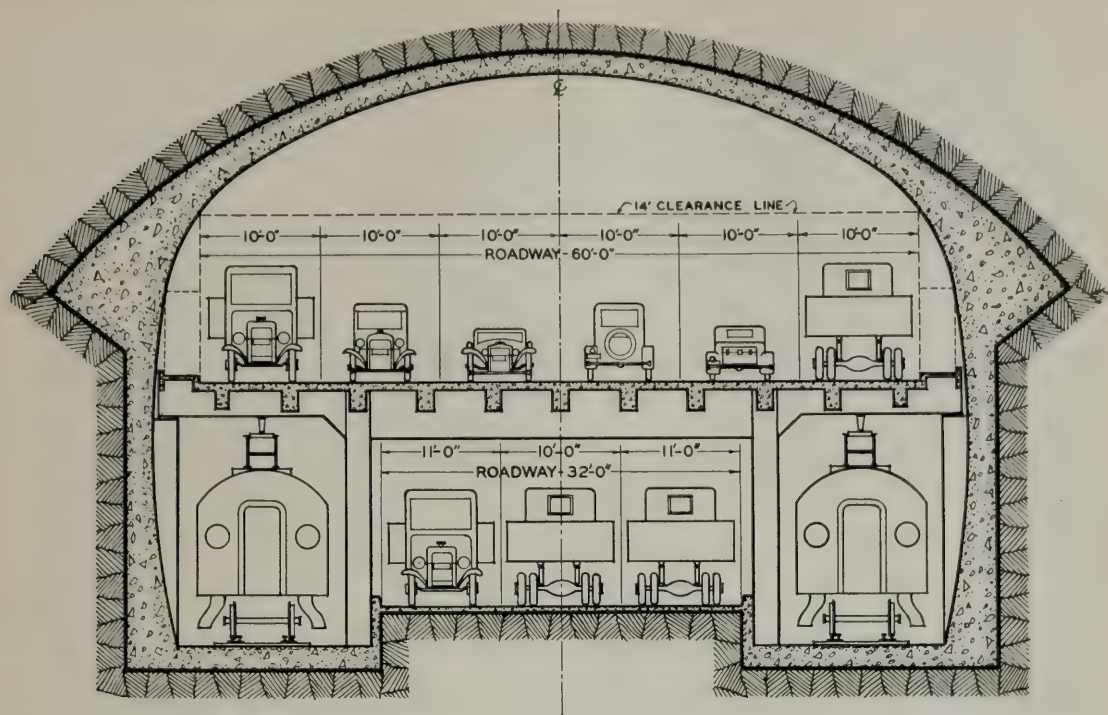


C. H. PURCELL

In all other major bridge projects comparable to this one the physical and geographical conditions have been much more definite. In such structures as the Fort Lee Bridge over the Hudson River, or the Golden Gate Bridge, nature herself and the requirements of navigation have decided what type of structure and span length are required. The designing engineers have only had to determine whether or not such a span length was possible and, having done so, make the proper design therefor.

Complicated Situation

In the case of the San Francisco-Oakland Bay Bridge, the conditions are entirely different. The Army engineers have determined the navigation clearances necessary, but nature has not been so definite, the result being that there are at least three or four span layouts which will comply with the navigation requirements. It devolves upon the engineer to select



ANOTHER WORLD WONDER will be this tunnel unit of the San Francisco-Oakland Bay Bridge project through Yerba Buena Island. The tunnel will be a two-deck structure 500 feet long with a cross-section approximately 70 feet wide and 50 feet high. On the upper deck will be carried six lanes of fast automobile traffic, including both passenger cars and light trucks. Two interurban railway tracks will occupy the outside lanes of the lower deck and three lanes of heavy motor traffic will be accommodated in the central roadway.

from this number the structure which will most efficiently and economically meet traffic needs, and which will be financially feasible.

In order to make such a determination, designs must be developed for various modifications of each of the three or four types, instead of only one. The cost of each must be accurately determined and the traffic capacity and general structural desirability closely and carefully studied.

In the channel east of Yerba Buena Island the engineering problems are of an entirely different character, but no less complicated. In the west channel the very character of the structure involving as it does the extremely heavy pier concentrations under long spans, makes it mandatory to sink piers to solid rock.

In the east channel the superstructure problem is much more definite than in the west channel, but the foundation problem is far more indefinite. The lighter spans with much lighter pier concentrations, coupled with the much greater depth to rock, immediately raise the question of whether or not foundations should go to rock, or be sustained by piles or cylinders deeply embedded in the overlying stiff clay strata.

Piers on Piles

As a point of general information, the rock depths east of the island vary from zero at the island to 500 feet near the Oakland shore. Fortunately the sustaining power of the overlying material at a given depth increases due to higher sand content as we advance from the island toward Oakland.

Obviously it is not feasible to sink a pier to 500 feet below water, as it occurs over the easterly mile of the bridge structure; and these piers which are under short spans will be sustained on piles. Our chief concern is with the easterly pier under the 1400-foot span adjacent to the island, where rock is found at 300 feet below water, and at the piers under the 500-foot spans just to the east of the 1400-foot span, where rock is from 300 to 350 feet below water.

In each of these cases very diligent search of the strata overlying rock is being made in an attempt to find strata of sufficient bearing power to sustain piers short of rock. Casings are being sunk through this material and samples of the materials are being taken at 10-foot intervals of undisturbed material. These sam-

(Continued on page 17)

Beach Sand Successfully Used in Big Asphalt Surfacing Job on Coast

By F. W. HASELWOOD, District Engineer

THE old adage "circumstances alter cases" applies as potently as ever whether the question is whose cow was in his neighbor's cornfield or that of improving a road in the absence of construction materials that meet the usual requirements.

The quality of highway surfaces has been markedly improved in recent years by refinement in the specifications for material and the methods of combining them and placing them on the road. The proper selection, combination and placing of materials constitute a case of judicious and skillful application of the principles developed by experience and uniformly result in a durable and satisfactory road.

But suppose one or more adverse circumstances inject themselves into the picture. Will they alter the case? For instance, suppose that within practical limits of transportation from a road on which surface renewals are imperative there exists no mineral aggregate that complies with the requirements of the standard specifications or that is approved by the testing laboratory. Such a circumstance will have to alter the case or there will be no resurfacing.

GOOD BUT PARKED

On a recent project in Humboldt County near Big Lagoon where resurface was absolutely necessary, the only rock of satisfactory quality within hauling range was on a State park and could not be used. Laboratory tests were made of every other source of rock with the hope of devising some means of using a soft aggregate with some grade of asphalt. There existed a large deposit of conglomerate which was made up of soft rock that broke up readily in handling, disintegrated quickly when placed on the road and contained a large proportion of clay.

ON THE BEACH

The other available aggregates were beach sand from $\frac{1}{4}$ " down and a finer yellow sand available in cuts along the road. Except for the soundness of the beach sand, these aggregates did not meet any of the requirements of the specifications for aggregate for

road base or surface whether treated with asphalt or not.

A limited fund was available for the resurface and had to be stretched over a length of 8.4 miles. Both base and surface renewals were necessary. Base reinforcement was made with the conglomerate and the beach sand. This work was done by day labor. The conglomerate developed too much clay fines by the time it was spread but the addition of beach sand ranging up to $\frac{1}{4}$ " so changed the characteristics of the aggregate that a compact and well bound base was developed by thorough processing, watering and rolling.

The amount of clay in the conglomerate varied from none to nearly one hundred per cent, therefore the amount of sand applied varied accordingly and was determined by the foreman in charge. If he had too little sand his roller would likely get stuck in the mud. If he had too much the base would not bind. With one minor exception the empirical field combination of the two materials was so perfect as not to require retreatment.

HEAT DOES TRICK

So much for the base which gave every promise of stability if protected against wear and weather. But what about the top? The only aggregates available that were sound enough to be used with asphalt were the beach sand and the yellow roadside sand. The beach sand is round and polished. The laboratory had difficulty in getting cut back asphalt of any grade to adhere to the smooth surfaces. No combination of the two sands would result in a grading even approximating that required by the specifications.

Field tests were made to ascertain the behavior of different combinations of the two sands and asphalt under traffic. First, cut back 94+ road oil was used. The mixture was spread over the full width of the road to a depth of two inches and for a distance of about thirty feet. It did not roll or displace under traffic but on the other hand it did not harden and the asphalt did not adhere well to the beach sand.

The trouble appeared to be in the presence of the coal oil with which the asphalt was cut

(Continued on page 29)



BEACH GOLD MINE this proved to be for the highway builders in Humboldt County. With no supply of aggregate available they tried beach sand for asphalt paving and it worked.



QUICK ACTION was obtained with the new mixture. A few rakers were used but the roller was able to follow close to the spreader instead of three to five hours behind as with regular mixes.



PRETTY AS A PICTURE and fine as a road is the completed surface. Shoulders yet to be placed but edges don't break under traffic or roller even though headers were not used.

Right of Way Men Discuss Problems in First Annual Session

PROBLEMS and procedure relative to acquisition of right of way, were given two days of intensive study when district right of way agents met at headquarters in Sacramento on January 18th and 19th. The conference was the first ever held by the right of way organization and is indicative of the growing importance of the Right of Way Division.

Standardization of forms and procedure, as far as this may be desirable or possible, was one of the purposes of the discussions. The district right of way agents were asked to submit to headquarters a copy of all forms in use in the several districts and to make suggestions for a more efficient handling of right of way purchases.

TOPICS DISCUSSED

Among the matters discussed were conveyancing; deed forms; descriptions; recording; rights of way over public lands; contact with title companies; condemnation practice and procedure; interchange of service between districts; abandonment and relinquishments of right of way; right of way schedules; value of cost summaries; right of way allotments; Railroad Commission procedure; rights of way over school lands; procedure in acquiring right of way from estates; and numerous legal matters relative to right of way work.

Cooperation of the right of way agents in condemnation trials was discussed by George C. Hadley and Jack Howard, of the office of Hugh K. McKevitt, Attorney for the California Highway Commission.

At the conclusion of the meeting, the visiting district right of way agents adopted a resolution declaring they had gained great benefit from the discussions and thanking Col. Walter E. Garrison, Director of Public Works; James I. Herz, Deputy Director; C. H. Purcell, State Highway Engineer and C. C. Carleton, Chief of the Division of Contracts and Rights of Way, for authorizing the conference.

CHIEF CARLETON PRESIDED

C. C. Carleton, Chief of the Right of Way Division, presided. The following were the right of way agents in attendance: Frank B. Durkee and C. R. Montgomery, General Right of Way Agents, Sacramento; Phillip C. Eastman, Eureka; Leland L. Rose, Redding; Herman D. Jerrett, Sacramento; C. A. Marsh, San Francisco; E. W. Carson, San Luis Obispo; Henry A. Sellers, Fresno; Adolph N. Sutro, Los Angeles; J. B. Woodson, Bishop; George W. Pulich, Sacramento, District Right of Way Agents; Charles L. Flack, Assistant Right of Way Agent, San Bernardino, represented J. A. Gregory, the District Agent, who was prevented from being present by illness.

The following Assistant Right of Way Agents from the Sacramento Districts also attended: Stanley P. Cooley, B. J. Perry, Louis E. Davis, Louis J. Malatesta, Joseph T. Hinch, Charles T. Smith and Jay J. Herz, Assistant Right of Way Agent, from San Francisco, was present.

Preliminary Work on East Bay Highway and Tunnel Begun

WORK of clearing the right of way for the East Bay Broadway highway and tunnel project has begun and this modern motor route linking Alameda and Contra Costa counties will soon be under actual construction.

The plans for this project in which the State is cooperating with Joint Highway District No. 13 call for a new, wide highway to replace the winding and narrow tunnel road which connects with the present obsolete tunnel. The new road will lead to a new tunnel, designed to meet modern traffic requirements, passing under the hills lying on the boundary line of the two counties.

PROVIDES NEW TUNNEL

By act of the last Legislature the road from the easterly portal of the tunnel to Walnut Creek was brought into the State highway system and will be improved to take care of the increased traffic. The original estimated cost of the tunnel and connecting highways was \$4,849,000.

Under present plans the project in Alameda County will start at upper Broadway and Shafter avenue, the roadway curving upward at a 5 per cent grade of varying widths, although the right of way is always more than one hundred feet wide.

The new tunnel will start approximately 1100 feet west of the present tunnel portal and will continue to a point near what is known as the Fish Ranch and Lafayette roads.

TWO BORES PLANNED

Plans worked out by George A. Posey, Alameda County engineer, and practically decided upon, consider a design for the tunnel with two one-way bores, connected at intervals to aid ventilation. Each side of the tunnel would have a 21-foot roadway, with one lane for slow traffic and the other for fast traffic, and a pedestrian sidewalk.

The tunnel will be some 3000 feet long and about 300 feet lower than the present one. The cost of the tunnel alone is estimated at \$2,500,000. Connecting highway construction in Alameda County is estimated at \$985,000, while the cost of rerouting and reconstructing the existing tunnel road as far as Walnut Creek will be in excess of \$1,000,000.

CARRY TIRE CHAINS

Winter sports may now be enjoyed in a number of conveniently located places in the higher altitudes of northern, central and southern California. Roads to most of the popular areas for snow diversions are in good condition, although motorists should take the precaution of carrying tire chains for use on icy or wet surfaces.

"Did the signs of the big sale at Wisenheimer's attract much attention?"

"Did they!" Seven women drivers had accidents while driving past!"—*Motor Land*.

First Motorist: Are the rural people in Bloofus County courteous?

Second Motorist: Heavens, yes! Every time they misdirect you they say "You're welcome."

Jack: "Why did you quit calling on Eleanor?"

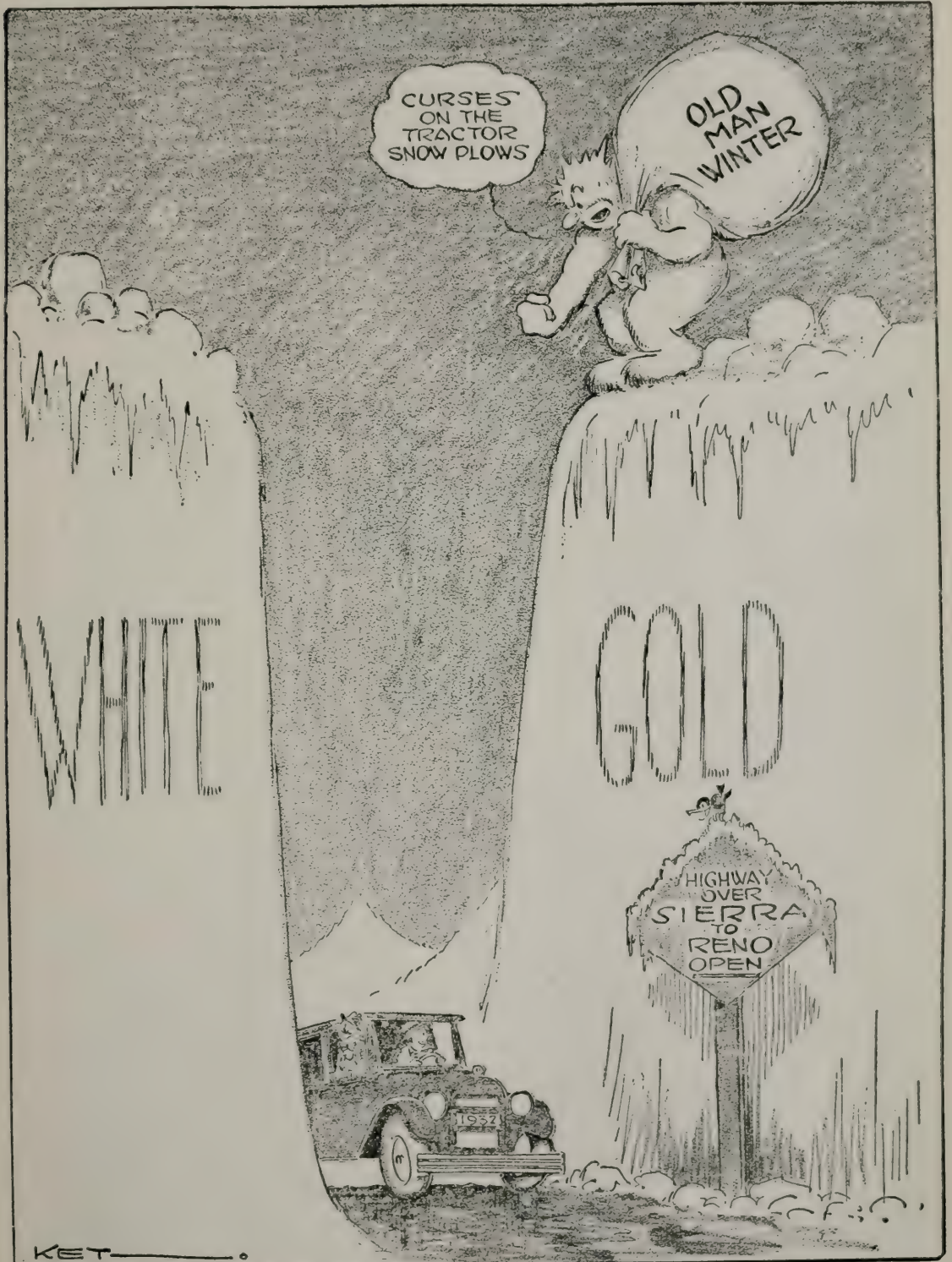
Fred: "Too many traffic signals."

Jack: "Huh?"

Fred: "Her father caught me kissing her and yelled 'stop' and then yelled 'go,' and her mother hung up a 'no parking sign.'"

GRAND CANYON OF THE SIERRA

By KET in Oakland Tribune



20-Mile Meca-Blythe Improvement

(Continued from page 1)

bids were opened for the placing of 14.6 miles of Portland cement concrete pavement between Tecate Divide in San Diego County and Mountain Springs grade in Imperial County, and within the coming month a contract will be awarded for placing a 20-foot asphalt concrete pavement from three miles west of Coyote Wells to Dixieland, a distance of 14.7 miles.

TWENTY-FOOT PAVEMENT

With the completion of this work and projects now in the course of construction, a smooth pavement, built to modern standards, will extend from Viejas Creek in San Diego County to El Centro, leaving only a few miles of the 15-foot pavement to be widened.

In Riverside County, on the El Centro-San Bernardino route through Coachella Valley, the connecting link between the heart of the fertile Imperial Valley with metropolitan Los Angeles, 14.3 miles of reconstruction will place a modern 20-foot Portland cement concrete pavement between the Imperial County line and Avenue 62. This improvement will complete the modern pavement on this route from El Centro to San Bernardino, with the exception of some 15 miles of 16-foot paving between White Water and Banning.

The 14-mile improvement to be undertaken this year will rectify alignment, eliminate the dips and raise the grade, making ample provision for proper drainage. This stretch of highway will connect at its southerly end with the new asphalt pavement recently placed between the Salton Sea and the Imperial-Riverside County line.

Further improvement to another of the interstate routes will be noted by the start of construction early this spring on nearly 20 miles of the Mecca-Blythe lateral which connects the gateway into southern California at the Ehrenberg Bridge with the San Bernardino-El Centro trunk highway at Coachella in Riverside County. Nearly 50 miles of this route have been completed to modern standards of desert highway construction from Blythe to 9.5 miles west of Desert Center and the proposed work will carry this improvement to Shavers Summit.

The new alignment will skirt along the southerly edge of the Chuckawalla Valley between the proposed Hayfield Reservoir of the Colorado River Aqueduct and the Chuckawalla Mountains.

PAVING TWO SECONDARIES

Two important improvements in Los Angeles County will be made on two of the secondary routes which were added to the State highway system by the last Legislature. The one, on the road between Pomona and Los Angeles, will comprise placing Portland cement concrete pavement on essential sections. The Division of Highways will supplement the general improvement which the county had started when the route became a part of the State system. It is estimated that 11 miles of this route will be paved this year. The other project involves similar paving on about six miles of the Pomona-Fullerton lateral between Brea Canyon and Pomona.

An important improvement in San Bernardino County will be the grading and surfacing with bituminous treated crushed rock the five miles from San Bernardino through Waterman Canyon

on the highway leading to Big Bear Lake in the San Bernardino Mountains. This highway is one of the most popular recreational roads in southern California, leading as it does to the many resorts at Lake Arrowhead and Big Bear.

The State, in cooperation with the United States Bureau of Public Roads, has constructed this mountain highway to modern standards from Camp Waterman to Big Bear Lake and the proposed improvement will modernize that portion of the road through the canyon.

Grading on the entire length of the Ridge Route alternate is now well advanced and during the coming year it is planned to award additional minor contracts. The new routing follows the canyon to the west of the existing tortuous climb over the Ridge Route and will not only facilitate travel on this important road by presenting modern alignment and grade but will likewise shorten the distance by nearly ten miles.

NEXT STEP PROVIDED

The reconstruction of the present State highway from Gorman to the Kern County line will carry the improvement of this highway some three miles northward and will be the next step in modernizing the grade and alignment of this route. Funds for this project were provided at the meeting of the Commission on January 8th.

An important project to begin in 1932 will be the construction of a bridge across the Kern River on the new alignment of the highway at Bakersfield. The new structure will be about one-half mile long and will obviate the use of the present concrete arch with its narrow roadway, which spans the river on the existing alignment.

Further improvement to the Coast highway which skirts the Pacific from Oxnard in Ventura County to Serra in Orange County includes the reconstruction and paving of the six miles from Laguna Beach to Dana Point, as well as the paving from Newport Beach to Corona del Mar. This route, passing through the beach cities and seaside resorts of southern California, carries the heaviest traffic of any route on the State system and its improvement to super-highway proportions is being pushed forward as rapidly as funds will permit.

In the northern portion of California many important projects will be undertaken this year and a few of the larger ones are included in the following:

ELIMINATES CURVES

On the Redding-Alturas lateral two proposed major projects involve the grading and surfacing of 18.5 miles between Canyon Creek, east of Burney, and Fall River Mills. This construction will involve a relocation of this part of this lateral and will eliminate the existing tortuous road which winds through the lava country over many small summits. This improvement will connect at Fall River Mills with some 66 miles of recently improved highway and will eliminate one of the worst portions between Redding and Alturas.

The work proposed for 1932 also includes the construction of bridges across Pit River, Hat Creek and Fall River west of Fall River Mills.

Pushing Work on Coast Super-Highway

(Continued from preceding page)

In Butte County further work is proposed this year on the construction of the new and scenic Feather River Highway connecting Oroville and Quincy with an all-year road which will follow along the precipitous walls of Feather River Canyon. The new alignment of this route holds to as low elevations as possible, reaching a summit of 2300 feet, while the old road connecting these two county seats rises to 6000 feet and is snow blocked from five to six months a year. The improvement proposed for this year will involve heavy grading and rock excavation over the eight miles from Pulga to the Plumas County line.

The substructure for the steel bridge which, with its 350-foot steel arch, will cross the Feather River at Pulga, has been completed and work on the steel superstructure is progressing.

IN REDWOOD EMPIRE

A much-needed improvement to the Redwood Highway will be started this spring with the awarding of a contract for grading 14 miles of a 37-foot roadbed between Cloverdale and Hopland. The new road will be built on an entirely new alignment following the Russian River and eliminating the eight miles of maximum grade and sharp curvature now made by the existing road over the hills between Cloverdale and Hopland. This new routing, aside from being a great improvement in grade and line, will present to the tourists traveling north a view of the scenic wooded country along the Russian River Canyon.

The highway will cross to the east bank of the Russian River at Preston about two miles north of Cloverdale and follow close to the river until it crosses again just south of Hopland. Passing through numerous groves of pine, fir, oak and cottonwood, the road gives many pleasing vistas along the river as well as excellent views of the rugged rock promontories which break into the west bank. Squaw Rock, a promontory some 700 feet in height, is the largest of these cliffs.

Several minor bridges, over creeks which enter into the river at various points, will be included in this contract. Two major structures crossing the Russian River and two grade separations with the Northwestern Pacific Railway will be constructed under separate contracts.

IMPORTANT LINK

In the San Francisco Bay area an important improvement will be the placing of 9.6 miles of Portland cement concrete pavement between San Pablo Creek, just north of Richmond, and the Carquinez Bridge. This pavement will be placed north and south of the recent construction through the towns of Hercules and Pinole and will involve some relocation of the present alignment and improvement in grade.

The construction of the Bay Shore Highway will be carried forward in Santa Clara County. It is being planned to continue the work on the six miles from Oregon avenue in Palo Alto to Alviso road this year. This 40-foot concrete pavement is rapidly approaching San Jose and its completion will give the Peninsula a modern super-highway from San Francisco to San Jose.

On the State highway between Merced and the Yosemite National Park, in Mariposa County, 7.6 miles of road on new location is to be graded during the coming year. This improvement will carry the work which is now under way between Orange Hill School and Pain Flat into Mariposa. This relocation lies to the north of the existing road and will be built to standards consistent with modern highway construction so necessary for the safety and convenience of the thousands of tourists who yearly enter the Yosemite by this route. The new alignment will lead directly into Mariposa by the same entrance as the existing highway.

ALONG RUGGED COAST

A structure of major proportions will be built across Rocky Creek on the Carmel-San Simeon highway in Monterey County. This bridge will be located about 17 miles south of Carmel at the southerly end of a grading contract which is now under way between Rocky Creek and San Remo Divide. It is also about one-half mile north of Bixby Creek where a large concrete arch is now being constructed. The proposed Rocky Creek bridge will be a reinforced concrete arch.

This structure will be another unit in the construction of this scenic highway which clings to the rugged coast of Monterey and San Luis Obispo counties.

Not the least important work in the program of the Division are the cooperative projects. Funds provided by the budget and by vote of the California Highway Commission amount to approximately \$2,750,000. The purpose of this cooperative set-up is to enable the Division of Highways to assist in the improvement of State highway routes within the limits of incorporated municipalities. By this cooperation, continuity of the standard of State highway improvement in the locality is attained, the full cost of which the abutting property could not bear.

COOPERATIVE BASIS

The customary basis of cooperation between the State and the municipality consists in the State grading, draining and paving to the same standard as the State highway leading to the cooperative project, and the local community paying for the remainder of paving and grading, placing curbs and sidewalks, and providing the right of way. The basis of cooperation is an individual problem for each project and an equitable distribution of cost is determined by conference with the local authorities.

Several such cooperative projects have been completed in 1931, or are under way at the present time in various communities and many more are contemplated for 1932.

The subject of State cooperation in improving a natural course of routing of a State highway within municipalities is one of paramount importance, and the applications to the State far exceed the amount of money available for this purpose. As these projects are handled on a cooperative basis and as State funds are limited, the policy has been adopted of giving prior consideration to those cities which show the greatest cooperation in advancing their portion of the obligation, such

(Continued on page 43)

California State Highway Organization Passes Its Twentieth Anniversary

Looking backward twenty years, the writer of the following article, C. C. Carleton recalls the organization of the first California State Highway Commission to which he was appointed the first attorney. The original bond issue gave that Commission the then fabulous sum of \$18,000,000 to build a State highway system. In this article Mr. Carleton draws some interesting comparisons and contrasts between the past and the present.

By C. C. CARLETON, Chief, Division of Contracts and Rights of Way

THE second day of this year marked the twentieth anniversary of the reporting for duty of the first seven division engineers of the California Highway Commission on January 2, 1912.

The first three State Highway Commissioners, their secretary, the State Highway Engineer and the writer, as attorney of the Commission, had been previously appointed in 1911, but the actual commencement of field operations did not begin until the division engineers entered upon their several assignments in seven different portions of the State.

Burton A. Towne of Lodi, as Chairman, Charles D. Blaney of Saratoga and N. D. Darlington of Los Angeles, as members, composed the pioneering California Highway Commission.

HAD "FABULOUS" FUND

To them was entrusted the expenditure of \$18,000,000, the proceeds of the first State highway bond issue, then considered a rather fabulous sum of money for public highway purposes.

In 1931, two decades later, it is interesting to note that Governor James Rolph, Jr., went back to the progressive little city of Lodi to appoint another administrative head of the State highway activities, namely, Colonel Walter E. Garrison, now Director of Public Works.

The original State Highway Commissioners were appointed from three widely separated sections of the State, in order that they might be as representative as possible of the several portions of California.

SAME POLICY CONTINUES

Today that same policy is pursued. Although having State-wide powers and duties it is but natural that the individual Commissioners should be somewhat better informed of the

needs of their respective communities and any action taken by the board becomes the resultant of the combined special knowledge and local experience of the Commissioners.

The present California Highway Commission is composed of five members instead of three.

Chairman Earl Lee Kelly resides at Redding, Commissioner Harry A. Hopkins at Taft, Commissioner Timothy A. Reardon at San Francisco, Commissioner Frank A. Tetley at Riverside and Commissioner Philip A. Stanton at Anaheim.

We of the original staff of the California Highway Commission first reported at the temporary office of the Commission then located in two committee rooms on the fourth floor of the State Capitol Building, at Sacramento.

TWENTY YEARS GROWTH

Now, twenty years later, approximately 14,000 employees are on the roster of the Division of Highways and extensive headquarters and district offices, equipment shops and maintenance yards are maintained at many points, all teeming with activity in handling the State highway system of California representing an expenditure of over two hundred millions of dollars, or more than ten times the outlay originally contemplated when the \$18,000,000 bond issue was voted in the fond hope that it would complete a State highway system.

On August 7, 1912, the first shovel of earth on Contract Number One under the first State highway bond measure was moved by Chairman Towne in San Mateo County between South San Francisco and Burlingame on the coast highway leading from San Francisco to Los Angeles.

Since that historic occasion thousands of miles of ribbon in the form of modern highways have been unreeled to the immeasurable advancement of the material prosperity of this



FIRST STATE HIGHWAY work began August 7, 1912, at a point on the coast highway in San Mateo County between San Francisco and Burlingame when Burton A. Towne, then chairman of the Highway Commission, turned the first shovelful of earth as shown in the above picture taken from the book "California Highways" written and published in 1920 by Ben Blow, now field secretary of the National Automobile Club. Chairman Towne thus started work on Contract No. 1, the first contract awarded by the first California State Highway Commission. The lower picture shows the road as it looks today.

commonwealth, as well as abundantly contributing to the comfort, convenience and enjoyment of its citizenry and its multitudes of visitors.

ENTERING THIRD DECADE

It is fitting that we should thus take stock of these accomplishments at the commencement of this new year, as we are entering upon the third decade of systematic State highway activity.

It would require a publication larger than this to carry the honor roll of those who have contributed to the signal success of the State highway work of California.

Every public spirited citizen and organization has sacrificed time and means to promote some phase of the development.

Loyal and zealous staffs of officers and employees have carried on the work itself without stint of service or stain of scandal.

Numerous Highway Improvements Under Way in Four Southern Counties

By S. V. CORTELYOU, District Engineer

SEVERAL highway construction projects of major importance are either under way or will be shortly let to contract in Los Angeles and neighboring counties.

LOS ANGELES COUNTY—One of the largest projects and one of greatest general interest is the Ridge Route Alternate which will supplant the present Ridge Road that has been in use since 1916. This new project, 26.85 miles in length, will be a modern high-speed highway. It will extend in nearly a direct line from Castaic School at the southerly end of the present Ridge Road to Gorman.

The grading work on this project has been let in three contracts. Grading work on the first of these contracts, from Castaic School to Canton Creek, a distance of 7.1 miles, has been completed. The second contract, extending from Canton Creek to Piru Creek, a distance of 7.32 miles, is under construction and work is in progress on the third contract, 12.50 miles in length.

WORKING TWO SHIFTS

Seven power shovels, each working two shifts per day, and a fleet of trucks are moving the huge amount of earth and rock which will form the new roadbed on which the future paving will be laid. From present indications grading operations will be completed early next fall in readiness for the pavement to be placed.

Another project of major importance to the residents of Los Angeles and vicinity will be the improvement of the portion of the Roosevelt Highway between the city of Santa Monica and Beverly boulevard, a distance of 2.4 miles. This project will shortly be let to contract with the view to completing it before the heavy traffic of the summer months. The new pavement will be 40 feet wide with oiled earth shoulders 20 feet wide on each side. During the summer this is the most heavily traveled highway in the State on account of the heavy beach traffic.

COUNTY COOPERATING

Another link in the Roosevelt Highway is now under construction between Washington Boulevard at Venice and El Segundo. This project is 5.9 miles in length and is to be paved with Portland cement concrete 40 feet wide. The county of Los Angeles is cooperating on this project to the extent of paying one-quarter of the cost of grading and paving.

A contract will be let in the near future for a grade separation on this project. The Roosevelt Highway will pass under the Pacific Electric Railway and Culver Boulevard. It is planned that this latter contract will be completed by the time the present grading and paving contract is finished so that the full length of highway from Washington Boulevard to El Segundo can be opened to traffic at the same time.

Another important traffic artery to be improved in the immediate vicinity of Los Angeles is Ventura Boulevard from Sepulveda Boulevard to Calabasas, a length of 10 miles, all located within the city limits of Los Angeles. A 10-foot strip of Portland cement

concrete will be added to the present 20-foot pavement except on short portions where grade and alignment changes are necessary to make this highway conform to modern standards. On these latter portions a new pavement 30 feet wide will be laid.

IMPROVING CITY LINK

The improvement of the State Highway connection through the city of Glendora along Alosta Avenue, a distance of 1.5 miles, will shortly be let to contract. This improvement will consist of a 40-foot asphaltic concrete pavement with 8-foot oil macadam borders. Los Angeles County is cooperating on this project, paying for one-quarter of the grading and paving.

In the Arroyo Seco above Pasadena a project is in course of construction which will eventually open up one of the largest recreational areas within the reach of Los Angeles. 4.09 miles of this road have been graded under two previous contracts. The first of these contracts, 2.65 miles in length, starting at Haskell Avenue, La Canada, was completed in July, 1930. The second contract, 1.44 miles in length, was completed in August, 1931. A third contract, 5.02 miles in length, extending to Colby Canyon, is now in progress.

The country traversed is extremely rough and scenic. Parking areas are being graded on certain points which will afford panoramic views of Los Angeles, Pasadena and neighboring towns as well as the ocean. This highway will ultimately connect with the highway to be constructed up the San Gabriel Canyon from Azusa to Crystal Lake and Pine Flats.

SIX NEW PROJECTS

ORANGE COUNTY—The pavement from the city limits of Fullerton to the Los Angeles-Orange County line is being widened to 30 feet; both Portland cement concrete and asphaltic concrete are being used on different portions. The length of this section is 4.25 miles.

A contract will shortly be let for paving a length of 1.93 miles in the city of Fullerton from the Pacific Electric Railway arch to the north city limits. This pavement will be 56 feet wide, with curbs, and will join the section now under construction at the northerly city limits. Orange County is cooperating on this project.

A contract is under way on the Coast Highway from San Mateo Creek near the San Diego-Orange County line to Doheny Park (Serra), a distance of 5.86 miles. The present 20-foot pavement is being widened to 30 feet (40 feet where adjacent to the Santa Fe Railway.) The new pavement is to be partly of Portland cement concrete and partly of asphaltic concrete.

WIDENING COAST ROUTE

An improvement which will relieve the congestion of traffic on the Coast Highway between Corona Del Mar and Laguna Beach, a distance of 5.54 miles, has recently been let to contract. The roadway on this section will be widened to a width

(Continued on page 44)

Transbay Tunnel Unit to Break Size Record for Bore

(Continued from page 7)

ples are being submitted to every known soil test to determine their bearing power and specific characteristics.

Test Loading

Single piles and pile clusters are being driven and loaded with test loads in excess of those which would be imposed by the bridge. These tests of necessity are slow and require considerable time to complete, yet they are absolutely necessary before the most economical design of the piers can be made. Many thousands of dollars can be saved in cost by such a study and the resulting economic design.

On the island, a tunnel of unprecedented cross-sectional dimensions is to be constructed to rock which is badly faulted and broken. A contract has been let for diamond drill boring to thoroughly survey the character of this rock.

In the cities of San Francisco and Oakland the question of proper and adequate approach and traffic distribution structures is very complicated and involved. These structures and their proper layouts involve many questions of property damage and benefit. They must be so constructed as to adequately collect and distribute traffic and, at the same time, cause as little property damage as possible.

Traffic Question

The carrying capacity of any bridge depends largely upon the proper collection and distribution of traffic. The question of adapting existing traffic facilities such as streets and electric lines to the new traffic conditions which will be created by the bridge is important and far reaching. All interests involved must be consulted and the plan worked out which will satisfy the greatest number at an economic cost.

These considerations, with many others not mentioned, require a great deal of time and study. The necessary decisions as to just what to design is much more difficult than the actual design after such a decision is reached. In this respect the San Francisco-Oakland Bay Bridge is outstanding, and may truthfully be said to be unprecedented in many respects.

Final borings will not be completed before the first of March and until some time after

EXTOLS EFFICIENCY OF ROAD CREWS IN STORM

Colonel Walter Garrison,
Dept. of Highways,
Sacramento, Calif.

My Dear Colonel:

Mrs. Tuller and I have recently returned from a rather extended automobile trip covering the roads over the Ridge Route through the San Joaquin Valley, Yosemite, Oakland and back by the Coast Route. We were driving during the recent storm and right afterwards. The difficulties that the Maintenance Department had to meet were obviously very great. They were meeting them with a degree of efficiency that was most gratifying. As a matter of fact, the work that was being done all along the highway would have been a great credit to the best organized private institution. After seeing the inefficiency of most public organizations, I can not refrain from writing you this letter to express my appreciation and tender my congratulations to you on the splendid manner in which your organization is functioning.

Sincerely yours,

(Signed) WALTER K. TULLER.

JUST PREPAREDNESS

The fair motorist was hitting it up along the open highway when ahead she spied three repairmen climbing telephone poles.

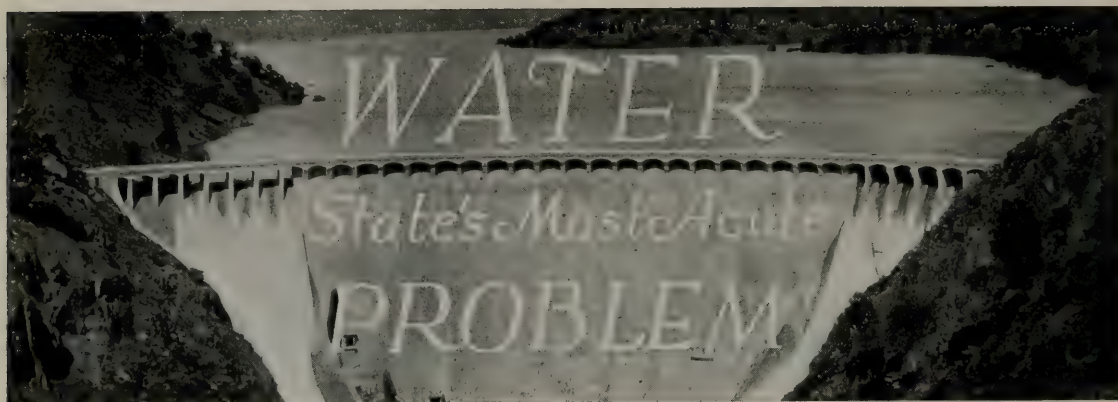
"Aren't they silly!" she said to her companion; "they must think I've never driven a car before."—*Motor Land*.

Photographer (taking pictures of father and college-boy son): Perhaps it would make a better picture, my boy, if you were to stand with your hand on your father's shoulder.

Father: The picture would be more natural if he stood with his hand in my pocket.—*Photographic Digest*.

the completion of borings no final determinations can be made. Practically every possible superstructure layout which is feasible has been drawn up and is being considered and studied as far as it is possible prior to final completion of foundation borings. These, with data on borings to date, will be presented to the Consulting Board of Engineers at their next meeting, and no doubt final decisions as to many features of the project will be made at that time.

The engineers in charge of this work feel that satisfactory progress is being made, and are anxious and willing to have any interested person or representative call at 500 Sansome street for any information which may be available in regard to this project.



This is the sixth of a series of articles on the State's water problem. The first dealt with Governor Rolph's call for a united effort to reach a solution. The second, third and fourth articles described, respectively, the situation in the Sacramento Valley, Sacramento-San Joaquin Delta, San Joaquin Valley and Los Angeles regions. This article is the second installment of a paper covering the financial aspects of the immediate initial and complete initial developments of the State's plan for the Sacramento-San Joaquin Valley project. The estimated costs of the project were presented last week and this installment deals with anticipated revenues and possible methods of financing.

By A. D. EDMONSTON, Deputy State Engineer

THE direct revenues which could be anticipated from the operation of the Great Central Valley project to meet the gross annual costs discussed in the December issue of this magazine are from two sources, as follows:

1. Sale of electric energy.
2. Sale of water.

About 1,600,000,000 kilowatt hours of electric energy could be produced annually on the average at the power plants of the Kennett and Friant units. The value at the power plant of this large block is estimated at from 2.65 to 2.42 mills per kilowatt hour for that part generated at the Kennett unit depending on the method of operation and 3.50 mills for that generated at the Friant dam.

These values are based on the lowest of several estimates of the cost of producing an equivalent amount of electric energy of the same characteristics with a steam-electric plant located in the area of consumption, taking into account the cost of transmission and transmission losses from point of generation to load centers.

ESTIMATED REVENUES

Under the immediate initial development, the revenue from the sale of electric energy

is estimated at \$4,585,000 and under the complete initial development, \$3,906,000.

The lesser estimated revenue under the latter plan of development is due to the reasons that a lesser amount of power would be produced and that it would have less desirable characteristics for absorption into the power market. The foregoing sums of revenue from sale of electric energy are the total amounts which would be realized when the energy is fully utilized and sold at the unit prices stated.

It is assumed in the financial analyses that arrangements could be made with producing and marketing agencies to plan their development so that the entire power output of the project could be absorbed into the power market at the time of the completion on the Kennett unit.

The project would be operated to serve many beneficial purposes, namely:

1. Improvement of navigation on Sacramento and San Joaquin rivers.
2. Improvement of water supply of lands under irrigation along Sacramento River.
3. Protection of Sacramento-San Joaquin Delta from invasion of salty water and thereby furnish an ample and suitable water supply to irrigated lands in the delta.

Four Methods of Financing Project

(Continued from preceding page)

4. A dependable and suitable water supply to the industrial and agricultural areas along south shore of Suisun Bay.

5. A supplemental water supply to developed areas with deficient supply in upper San Joaquin Valley.

Flood waters would be stored in Kennett reservoir during months of plenteous run-off and later released at the dam into the Sacramento River during periods of low run-off to meet fully the foregoing requirements on the Sacramento River, in the Sacramento-San Joaquin delta and in the Suisun Bay industrial and agricultural areas. Such operation would permit the diversion of water from the San Joaquin River at Friant into upper San Joaquin Valley.

OBTAINED FROM SURPLUS

Under the immediate initial development, the water diverted would be that obtainable from the existing surplus in that stream and from the "grass land" water rights on San Joaquin River, which would be purchased. With the complete initial development, waters in addition to those mentioned could be so diverted by the installation of the San Joaquin River pumping system.

In the operation of Kennett reservoir, about 345,000 acre-feet seasonally, on the average would be released from storage specifically to meet the navigation requirements on Sacramento River. Because of the improvement of navigation on this stream, a direct contribution of \$6,000,000 to the project would be expected from the Federal Government. This sum has been deducted from the capital cost in the financial analysis.

In order to control salinity in the Sacramento-San Joaquin delta and to furnish a full and dependable supply to the lands under irrigation along the Sacramento River and in the Sacramento-San Joaquin delta, an average amount of about 420,000 acre-feet seasonally would have to be released from stored water to satisfy these requirements.

AVERAGE COST

The amount of revenue which could be obtained for stored water applied to such uses is problematical. However, the estimated average cost of such stored water with Kennett reservoir operated entirely for irrigation purposes and with allowances for power credit, is \$1.00 per acre-foot. Due to the uncertainty of the amounts of direct revenue which might be obtained from these sources, no sum therefrom has been included in the financial set-ups which follow.

About 43,500 acre-feet annually could be diverted from the delta by the Contra Costa County conduit. It is estimated that a revenue of \$300,000 per year could be obtained from the sale of this water. In the upper San Joaquin Valley, under the immediate initial development, about 600,000 acre-feet would be made available to the developed lands with deficient water supply. Based on a price of \$3.00 per acre-foot main canal side, the estimated revenue would be \$1,800,000 annually. Under the complete initial development, 1,720,000 acre-feet would be available. The estimated revenue if all the water were sold at \$3.00 per acre-foot at canal side would be \$5,160,000.

The revenues from sales of electric energy and water under both immediate and complete initial development, under the foregoing assumptions are:

Item	Estimated Revenues	
	Immediate Initial Development	Complete Initial Development
Electric Energy Sales----	\$4,585,000	\$3,906,000
Water Sales-----	2,100,000	5,460,000
Total -----	\$6,685,000	\$9,366,000

METHODS OF FINANCING

Some of several possible methods of financing the project are:

1 FEDERAL FINANCING. Under this method either funds would be advanced by the Federal Government to the State for construction of the project or the Federal Government would appropriate the necessary sums and itself construct the project. The State would guarantee the repayment of principal and interest and assume control and supervision of operation after completion of the project. The repayment of capital and payment of interest to Federal Government could be further secured by impounding of contractual revenues from sales of electric energy and water. An interest rate of $3\frac{1}{2}$ per cent per annum and a repayment period of 50 years are assumed in the analysis.

2 STATE BOND ISSUE. With this method, the State would issue bonds in the necessary amounts to construct the project and would meet the net annual costs, after deductions for revenues, either from the general fund of the State or by levying of assessments in proportion to benefits received. The interest rate would be about $4\frac{1}{2}$ per cent per annum and the period of amortization from 40 to 70 years.

DISTRICT BOND ISSUE

3 DISTRICT FINANCING. Under this method, a district would be formed to include all the areas benefited. Bonds would be issued, which would be secured by the taxable property within the district. The interest rate would probably be from 5 to 6 per cent per annum and the period of amortization of bonds, 40 years.

4 STATE WATER CONSERVATION FUND. By this method, a revolving fund would be created for the purpose of constructing water conservation projects of State-wide interest. The fund would be established either through a direct appropriation or by levying a tax on a commodity or commodities for a definite period of time. The project would be constructed with funds so obtained and the entire cost would be paid back into the revolving fund over a 40-year or some other adopted period, without interest. In the analysis, it is assumed that the annual payments would be equal over a period of 40 years.

INDIRECT BENEFITS

In a project of state-wide concern, there are benefits which may be classified as indirect which are of such moment that either the state as a whole or certain regions might contribute financially to the project

Whole Area Would Share In Benefits

(Continued from preceding page)

because of such indirect benefits. These indirect benefits should be considered in the analysis of economic soundness of the project.

In the development of the highway systems of this and other states through bond issues, gas taxes, and Federal aid the State, Federal government, public and private agency and individual receive no direct return from such expenditures but do receive indirect benefits by reduction of cost of operation of motor vehicles over the improved highways. If these indirect benefits were evaluated, undoubtedly they would far overbalance the costs of the improvements. The costs of such improvements, however, are not directly repaid.

If the state water plan were consummated and in operation, many agencies and localities would be indirectly benefited and perhaps should pay to the projects either in accord with their ability to pay, in proportion to the benefits received or in accord with a combination of the two criteria.

METHODS TABULATED

The following table sets forth for the four methods of financing, the capital and gross annual costs, the anticipated direct revenues per year and the net annual costs. The figures for the estimated revenues do not include any sums which might be obtained from the areas benefited in the Sacramento Valley and in Sacramento-San Joaquin delta or any amounts for the indirect benefits which would accrue to other interests and localities.

Method of Financing	Interest Rate in per cent	Period of Amortization in years	Immediate Initial Development			Complete Initial Development				
			Capital Cost	Gross Annual Cost	Revenues	Net Annual Cost	Capital Cost	Gross Annual Cost	Revenues	Net Annual Cost
1	3½	50 (1)	\$126,600,000	\$7,165,000	\$6,685,000	\$480,000	\$145,300,000	\$9,544,000	\$9,366,000	\$178,000
2	4½	40 (2)	129,500,000	8,982,000	6,685,000	2,297,000	148,500,000	11,660,000	9,366,000	2,294,000
		70 (2)	129,500,000	7,975,000	6,685,000	1,290,000	148,500,000	10,505,000	9,366,000	1,139,000
3	5	40 (2)	131,000,000	9,737,000	6,685,000	3,052,000	150,200,000	12,543,000	9,366,000	3,177,000
		60 (2)	133,900,000	11,284,000	6,685,000	4,599,000	153,500,000	14,345,000	9,366,000	4,979,000
4	0	40 (3)	116,200,000	4,537,000	6,685,000	*2,148,000	133,700,000	6,443,000	9,366,000	*2,923,000

* Profit.
(1) 3½ per cent sinking fund. (2) 4 per cent sinking fund. (3) Straight line amortization.

A study of the data in the foregoing table reveals that the project is not capable of being financed from the direct revenues assumed obtainable from the sales of electric energy and water, except under method 4. With this method no interest would be charged the project but principal would be repaid over a period of 40 years. It should be noted, however, that under method 4, the period of construction would be determined by the sums available annually for that purpose. If these sums were relatively small as compared to the

total cost of the project, the construction period necessarily would be long.

It is apparent, therefore, that unless money is obtained at a very low rate of interest, revenues from other sources must be obtained if the project is to be financed.

VALUES ENHANCED

There would be many beneficiaries, if the proposed Great Central Valley project were developed. Municipalities, public utilities, transportation companies, banks and other financial houses and others would be indirectly benefited. The lands under irrigation along the Sacramento River, the Sacramento-San Joaquin delta and the lands within Sacramento Flood Control project would receive substantial benefits. Business in municipalities in both the San Joaquin and Sacramento valleys and in the metropolitan centers of San Francisco and Los Angeles would be enhanced by the solution of the water problems through instrumentality of the project.

These indirect benefits were given careful consideration in the deliberations of the California Joint Federal-State Water Resources Commission. In its report of 1930, the Commission states in reference to the Great Central Valley project, "In the way of what might be termed direct benefits, that is, benefits directly to the land receiving the water, the cost will exceed any increment of value it will bring. When, however, the

indirect benefits are taken into consideration, the values that will accrue to the whole area affected, to the cities and towns it contains and which are dependent upon its prosperity, to its merchants, bankers and business men in general, to its transportation and other public utility companies, to all who are immediately affected by its general prosperity or decadence, **your Commission feels it is fully justified in recommending the project as one that is economically sound. This it does.**"

AUTO ACCIDENTS INCREASING

According to statistics lately released, the automobile accident death toll in the United States for the first eight months of last year is placed at more than 21,000, against a corresponding number of deaths during the same period for 1930 of slightly over 20,000. These figures indicate that there were five more fatali-

ties every day of the first eight months of 1931 than for the first eight months of 1930, and show an increase of 5.6 per cent.

Honey: That boy you were riding with has trouble with his vision.
Girl: Yeah, he sees parking spots before his eyes.—
State Lion.

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of December, 1931.

TRINITY COUNTY—Little Boulder Lake Dam No. 213. Buckeye Placer Mines, Inc., Carrville, owner; earth and rock walls, 8½ feet above streambed with a storage capacity of 32 acre-feet, situated on Little Boulder Creek tributary to Coffe Creek and Trinity River in Sec. 21, T. 37 N., R. 8 W., M. D. B. and M., for storage purposes, for mining use.

SAN DIEGO COUNTY—Lindo Lake Dam No. 830. County of San Diego, San Diego, owner; earth, with a storage capacity of 200 acre-feet, located in Sec. 19, T. 15 S., R. 1 E., S. B. B. and M., for storage purposes, for recreation use.

Applications for approval of plans and specifications for construction or enlargement of dams filed with the State Department of Public Works, Division of Water Resources, during the month of December, 1931.

LOS ANGELES COUNTY—Upper Hollywood Dam No. 6-29. City of Los Angeles, Los Angeles, owner; earth, 72 feet above streambed with a storage capacity of 192.6 acre-feet, located in Sec. 34, T. 1 N., R. 14 W., S. B. B. and M., for storage purposes, for domestic use. (Amending application filed December 19, 1929.) Estimated cost \$163,500; fee paid \$1,317.50.

SAN BERNARDINO COUNTY—Greenspot Dam No. 809. Western Fruit Growers, Inc., Los Angeles, owner; earth, 30 feet above streambed with a storage capacity of 17 acre-feet, tributary to Santa Ana River in Sec. 8, T. 1 S., R. 2 W., S. B. B. and M., for storage purposes, for irrigation use. Estimated cost \$3,000; fees paid \$30.

PLUMAS COUNTY—Walker Dam No. 271. Walker Mining Company, Walkermine, owner; earth, 30 feet above streambed with a storage capacity of 25 acre-feet, situated on Little Grizzly Creek tributary to Indian Creek in Sec. 7, T. 24 N., R. 12 E., M. D. B. and M., for storage purposes, for mining debris use. (Amending application filed October 15, 1929.) Total estimated cost \$14,637.29; total filing fee \$146.37.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of December, 1931.

ALPINE COUNTY—East Lost Lake Dam No. 512. R. W. Bassman et al., Fredricksburg, owner; earth, situated on Faith Valley Creek tributary to West Carson River in Sec. 1, T. 9 N., R. 18 E., M. D. B. and M.

ALPINE COUNTY—West Lost Lake Dam No. 512-2. R. W. Bassman et al., Fredricksburg, owner; earth, situated on Faith Valley Creek tributary to West Carson River in Sec. 12, T. 9 N., R. 18 E., M. D. B. and M.

LASSEN COUNTY—Goodrich Dam No. 237-2. Red River Lumber Company, Westwood, owner; earth, 6 feet above streambed with a storage capacity of 60 acre-feet, situated on Hamilton Branch tributary to Feather River in Sec. 35, T. 29 N., R. 9 E., M. D. B. and M. (Removal.)

SAN DIEGO COUNTY—Lindo Lake Dam No. 830. County of San Diego, San Diego, owner; earth, tributary to Quail Canyon in Sec. 19, T. 15 S., R. 1 E., S. B. B. and M., for storage purposes, for recreation use.

SAN MATEO COUNTY—Dianda Dam No. 615. Henry Lime and Cement Company, San Francisco, owner; earth and concrete, situated on Denniston Creek, located in Rancho Corral de Tierra Mares.

TUOLUMNE COUNTY—Stanislaus Forebay Dam No. 97-83. Pacific Gas and Electric Company, San Francisco, owner; earth, located in Sec. 5, T. 3 N., R. 15 E., M. D. B. and M.

EL DORADO COUNTY—Webber Creek Arch Dam No. 53. El Dorado Irrigation District, Placerville, owner; arch, situated on Webber Creek tributary to American River in Sec. 18, T. 10 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Lower Spencer Lake Dam No. 298. Andrew Bachels, Four Hills, owner; rock, situated on Middle Fork tributary to North Yuba River.

SAN MATEO COUNTY—Cowell Reservoir No. 615-2. Moss Beach Produce Company, Moss Beach, owner; earth, located in Rancho Corral de Tierra.

TRINITY RIVER—Little Boulder Creek Dam No. 213. Buckeye Placer Mines, Inc., Carrville, owner; earth between rock walls, situated on Little Boulder Creek tributary to Coffe and Trinity Rivers in Sec. 21, T. 37 N., R. 8 W., M. D. B. and M.

SAN MATEO COUNTY—Millbrae No. 2 Dam No. 618-2. Mills Estate, Inc., San Francisco, owner; earth, situated on a creek, located in Buri Buri Rancho.

CONTRA COSTA COUNTY—Lafayette Dam No. 31-2. East Bay Municipal Utility District, Oakland, owner; earth, tributary to Lafayette Creek, located in Sec. 26, T. 1 N., R. 3 W., M. D. B. and M.

FRESNO COUNTY—Sequoia Lake Dam No. 693. Y. M. C. A.—Sequoia Lake Conference, Fresno, owner; rock, situated on Mill Flat Creek tributary to Kings River in Sec. 1, T. 14 S., R. 27 E., M. D. B. and M.

LASSEN COUNTY—Coon Dam No. 249. W. W. Long, Susanville, owner; earth, situated on Coon Creek tributary to Horse Lake in Sec. 22, T. 33 N., R. 13 E., M. D. B. and M.

LASSEN COUNTY—Branham Flat Dam No. 249-3. W. W. Long, Susanville, owner; earth, situated on Branham Creek tributary to Horse Lake in Sec. 19, T. 33 N., R. 13 E., M. D. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of December, 1931.

SAN DIEGO COUNTY—El Capitan Dam No. 8-7. City of San Diego, San Diego, owner; hydraulic and rock fill, 197 feet above streambed with a storage capacity of 118,000 acre-feet, situated on San Diego River in Sec. 7, T. 15 S., R. 2 E., S. B. B. and M., for storage purposes, for municipal use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of December, 1931.

LAKE COUNTY—Detert Lake Dam No. 392. Richard Detert, San Francisco, owner; earth, situated on Bucksnot Creek tributary to Putah Creek in Sec. 9, T. 10 N., R. 6 W., M. D. B. and M.

RIVERSIDE COUNTY—Mockingbird Dam No. 814. Gage Canal Company, Riverside, owner; earth, situated on Mockingbird Canyon in Sec. 20, T. 3 S., R. 5 W., S. B. B. and M.

FRESNO COUNTY—Sequoia Lake Dam No. 693. Young Mens Christian Association, Fresno, owner; rock, situated on Mill Flat Creek tributary to Kings River in Sec. 1, T. 14 S., R. 27 E., M. D. B. and M.

EL DORADO COUNTY—Webber Creek Dam No. 53. El Dorado Irrigation District, Placerville, owner; arch, situated on Webber Creek tributary to American River in Sec. 18, T. 10 N., R. 12 E., M. D. B. and M.

RIVERSIDE COUNTY—El Caso Dam No. 822. G. O. Trauzettel, Redlands, owner; earth, situated on San Timoteo Creek tributary to Santa Ana River in Sec. 20, T. 2 S., R. 2 W., S. B. B. and M.

SAN MATEO COUNTY—Filoli Dam No. 617. Filoli Inc., San Mateo, owner; earth, situated on Branch of Laguna Creek tributary to San Mateo Creek in Sec. 30, T. 5 S., R. 4 W., M. D. B. and M.

TRINITY COUNTY—Little Boulder Creek Dam No. 213. Buckeye Placer Mines, Inc., Carrville, owner; earth fill, rock walls, situated on Little Boulder Creek tributary to Coffe Creek and Trinity River in Sec. 21, T. 37 N., R. 8 W., M. D. B. and M.

ALPINE COUNTY—East Lost Lake Dam No. 512. R. W. Bassman et al., Gardnerville, owner; earth, situated on Faith Valley Creek tributary to West Carson River in Sec. 1, T. 9 N., R. 18 E., M. D. B. and M.

Building Safety Into Super-Highway By Double Bridge Grade Separation

By **CHARLES WEST JONES**, Engineer Bridge Department

ALTHOUGH Aristotle failed to write upon the subject, you may believe it or not, vehicles which strike trains stop and sometimes they do not choose to run again.

The Railroad Commission of the State of California reports that each year in California over 1000 persons are injured or killed by steam and interurban railroads. This number does not include street car casualties within cities.

It is gratifying to note, however, that the number of casualties has been decreasing. The enactment of laws relative to stopping at crossings, the installation of warning signs, gates and wigwags and the schooling of children and adults in safety principles have probably all had good effect. Much has also been done in the matter of eliminating interference and hazard at railroad grade crossings by means of grade separation.

The grade separation method of securing safety is ideal but expensive. According to the Railroad Commission there are 12,300 crossings over main and branch railroads in the entire State. Only 550 crossings or 4½ per cent have been separated. This small percentage, however, has cost \$20,000,000.

STATE HAS PROGRAM

On the state highway system alone, which is used largely by through fast traffic the separation problem is of considerable magnitude. The State, year by year, is proceeding as best it can with an orderly program of separation giving first consideration to crossings which are most dangerous.

In determining which crossings are most dangerous the main criteria are volume and speed of train and vehicular traffic and degree of visibility.

To bring out some of the problems and principles of grade separation and structure work as applied to state highway construction an example will be given.

In connection with the building of a new super-highway along the coast in Los Angeles County between Santa Monica and Seal Beach to serve as a connecting link in the Roosevelt State Highway and relieve the dangerous,

time consuming and costly traffic congestion which prevails in this highly developed beach area, the State is engaged in building a number of grade separation structures and interesting bridges.

THREE PROJECTS COMPLETED

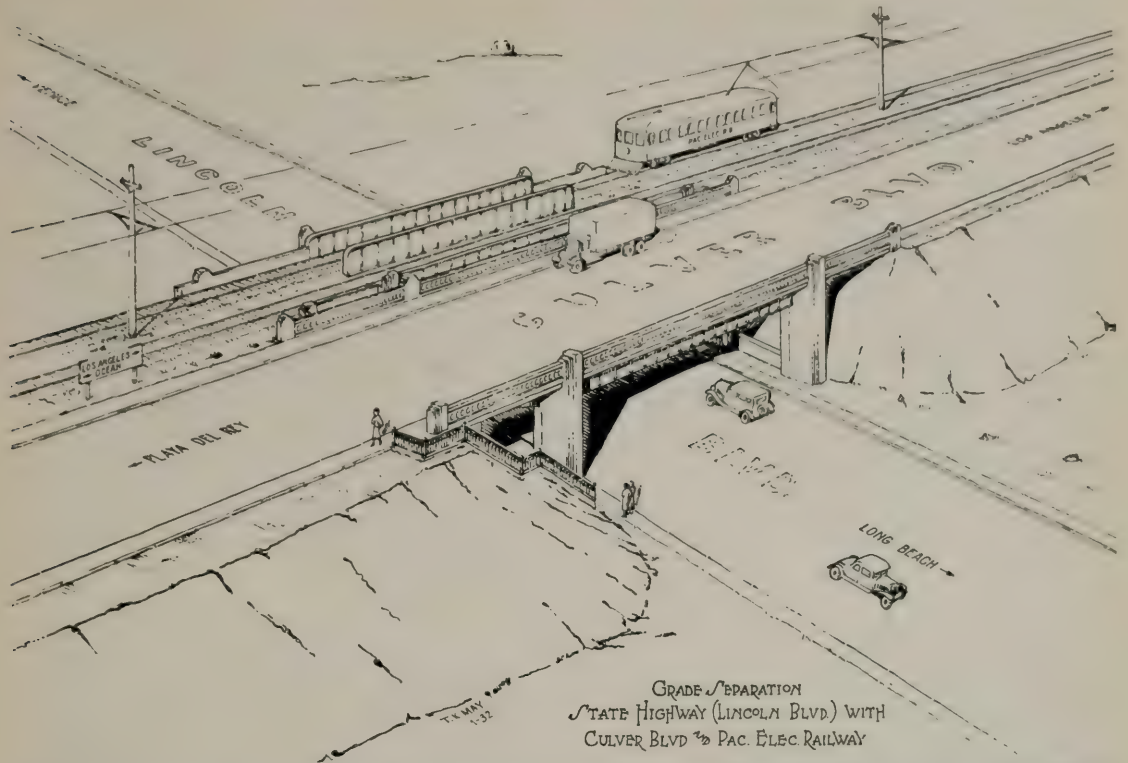
An imposing structure has been thrown across San Gabriel River, on new alignment which eliminates from the State highway a dangerous railroad crossing at Seal Beach. Further north, on this new road a new bridge, containing a removable span, conforming with War Department requirements, crosses Alamitos Bay. Still further north, in Manhattan Beach, where the new super-highway follows El Camino Real, the former dirt road is now a wide boulevard and a new grade separation has been built by the State over the Santa Fe tracks.

The next step in this program of structure building on this important connecting link of State highway will be the construction of a grade separation structure where the new super-highway will cut across the fast interurban del Rey-Redondo line of the Pacific Electric Railway and also cut across Culver Boulevard, a county road which is parallel and adjacent to the railway tracks. It will be located about one mile from the ocean, in the low tidal flat where Ballona Creek empties into the ocean a short distance south of Santa Monica, Ocean Park and Venice and immediately north of Playa del Rey hills and Loyola University.

MANY GOOD REASONS

Is there any good reason why the State should choose to build a grade separation at this point? There are a number of good reasons. While traffic on many State highways averages one, two, three and four thousand vehicles per day, traffic counts which have been taken on this coast highway near Santa Monica to the north, have in many cases exceeded twenty thousand vehicles per day, and in one case, on a holiday, a traffic count of fifty three thousand, three hundred and three vehicles for the day was recorded.

It is believed conservative to estimate that over 5,000,000 vehicles on the State highway



THEY SHALL NOT CRASH at the intersection of Roosevelt super-highway link and the Culver Boulevard just south of Venice in Los Angeles County, for an important grade separation will be effected by the imposing bridge structure shown above. In addition to carrying the State highway over the county road, the structure will provide two tracks for high-speed trains of the Pacific Electric Railway that serves this crowded beach area. It is estimated that 5,000,000 vehicles and 18,250 trains will pass through this intersection in a year.

will pass through this separation structure every year. During the same period of time approximately 18,250 trains will pass. On Culver Boulevard there will be a million or more vehicles, but there will be no boulevard stop, no congestion, no hazard and no delay, for Culver Boulevard as well as the railway tracks will be elevated and cross over and above the State highway.

EXPENSE IS SHARED

This construction which will cost approximately \$120,000 and which will be paid for jointly by the State, Los Angeles County and by the Pacific Electric Railway will render forever safe a portion of this road which we believe is destined to carry the heaviest traffic volume of all State highways in California. The structure will not only pay for itself many times over in time saving but it will also prevent many accidents.

Compared with many other grade separations which have been built and some that have been urged, the public will receive for its money a relatively large benefit per dollar expended. These arguments together with the

fact that the Railroad Commission has opposed the construction of a crossing at grade, answer the question why the State should choose to build a crossing at this particular locality.

The type of grade separation structure which should be built at any given locality is chiefly an engineering matter. Although we are enjoined by a certain good book to follow the wise policy of building on rock, the engineer must build structures where they are needed irrespective of fixed physical conditions.

ON MUD FLAT

In the case of the Culver Boulevard separation, the problem is to build a durable, attractive, adequate structure which will properly handle present and future flow of highway and railroad traffic, the structure to rest on a mud flat with water near the surface and build it in such a way as not to interrupt train traffic, keeping in mind always that the desired result is to be secured with a minimum expenditure of funds. In order to determine the underlying formation which must support the tremendous load of the structure

(Continued on page 35)

Relocating Grapevine Grade Unit of Ridge Route Cuts Out 95 Curves

By **E. E. WALLACE**, District Engineer

FOLLOWING the relocation of the portion of the Ridge Route located in District VII, Los Angeles County, the remaining portion of this important State highway is soon to be radically changed and improved.

The Ridge Route or Tejon Pass Route, as it was originally called, has always been the most direct route from Los Angeles to Bakersfield and the San Joaquin Valley. Authentic references are available of early travelers from southern California reaching the Great Central Valley by this route as early as 1854, but it was many years before a so-called road meandered over San Fernando Pass, through the Castaic Ranch and down Grapevine Canyon to the valley floor.

LOGICAL ROUTE

The part of the road within Kern County, from the Los Angeles county line, northeasterly for a distance of 11.6 miles comprising the Grapevine Grade was graded and paved during the period from September, 1919, to May, 1921. A 6 per cent maximum grade was adopted at that time, but with the limited funds available and the consequent necessity of avoiding heavy excavation and long hauls, it was necessary to depart from the old road at various places and to introduce considerable curvature, using a greatly improved grade at the expense of alignment and sight distance.

TRAFFIC INCREASED

Because of the advantage in distance and the better surface, the Ridge Route soon carried practically all through travel. The normal traffic increase and the development of long haul truck transportation between the San Joaquin Valley and Los Angeles, made the limitations of sharp curvature and short sight distance objectionable. Partial daylighting of the worst curves improved conditions somewhat but it remained a perilous undertaking for fast traffic to attempt passing the many slow-moving trucks and trailers that use this route.

To provide an adequate highway for present day traffic, a complete relocation of the Grapevine became a real necessity. The new route

follows a comparatively level course on the opposite side of Grapevine Creek from the present series of loops and hairpin turns leading down to the Bakersfield straightaway.

MINIMUM STANDARDS

The results of this relocation have been very gratifying and indicate that a high standard is obtainable at reasonable expense. The minimum standards adopted are:

Six per cent maximum grade, 1000 feet minimum radius curves and a 36-foot graded roadbed with right of way sufficient for an ultimate 56-foot roadbed. A 20-foot, two-lane pavement will be built for the present, but the capacity of this two-lane pavement will be much greater than the present pavement due to the high standard of alignment.

The danger of travel over this grade will be considerably reduced, as well as the time of travel, after construction along the new location has been completed.

In line with the progressive improvement of this route, the California Highway Commission appropriated sufficient funds for improving three miles of the Grapevine Grade. This money is now available and the work of grading and paving from Grapevine Station to three miles south will be advertised and placed under way early this spring. This project will correct the worst section of the grade and will eliminate the notorious "Loop" and "Death Curve."

A comparison of curvature and grade on the existing road with those on the proposed relocation of the entire Grapevine Grade follows:

	Present route	Relo- cation
Length	11.6 Mi.	10.3 Mi.
Number of Curves.....	115	22
of 80-100 Radius.....	6	
100-200 Radius.....	16	
200-300 Radius.....	28	
300-500 Radius.....	29	
500-1000 Radius.....	34	
over 1000.....	2	
Total No. Curves.....	115	22
Total Central Angles.....	4246°	513°
Max. Grade.....	6%	6%
Adverse Grade.....	0.4 Mi.	0 Mi.
Adverse Rise.....	25 Ft.	0 Ft.
Max. Elev.....	3826 Ft.	3808 Ft.
Min. Elev.....	1495 Ft.	1495 Ft.



UP IN THE AIR, the 115 curves and loops of the Grapevine Grade give it the appearance of a big snake doing some fancy contortions with its midships section where the loops occur.



"DEATH CURVE," they call this danger point on the Grapevine. It will be eliminated.



A HOLD-UP like this is a frequent experience for traffic behind a truck and trailer.



CUTTING CURVES out by the dozen from this Ridge Route unit the relocation of the Grapevine as shown by the diagram will also shorten the distance between Bakersfield and Los Angeles.

Major Highway Program for 1932

The program of the Division of Highways for this year as announced by Colonel Walter E. Garrison, Director of the Department of Public Works contemplates improvements in every county of the State, as set up in the budget passed by the last Legislature. Some of the major projects of this program that will be placed under way by April 1 and some that will be advertised between that date and the end of the year are shown in the following table:

Work to be placed under way by April 1, 1932

SOUTHERN COUNTIES

County	Location	Type	Miles
Imperial	Coyote Wells to Dixieland	Gr. and A. C. Pave.	14.7
San Luis Obispo	Cambria to San Simeon	Gr. and Surf.	8.6
Tulare	Lemon Cove to Three Rivers	Gr. and Surf.	10.6
Kern	Plaza Garage to Goshen and Plaza Garage to 0.3 of a mile westerly	Gr. and Pave.	5.8
Los Angeles	Las Flores Canyon to Santa Ynez Canyon	Gr. and Pave.	7.4
Orange	Dana Point to Laguna Beach	Gr. and Pave.	5.6
Orange	Newport to Corona Del Mar	Gr. and Pave.	3.7
San Diego	El Cajon to Las Coches Cr., portions	Gr. and Pave.	3.5
Los Angeles	Tujunga to La Canada	Gr. and Bridges	5.0
Los Angeles	Canton Creek to Piru Creek	Bridges	
San Bernardino	Baker east 10 miles	Gr. and Surf.	10.0
Riverside	Mecca-Blythe Road, portions	Gr. and Surf.	16.0
Riverside	6 mi. N. Imperial Co. line to Av. 62	Gr. and Pave.	8.3
Riverside	Imperial Co. line to 6 mi. N.	Gr. and Pave.	6.0
Los Angeles	Sepulveda Blvd. to Calabasas	Pave.	10.5

NORTHERN COUNTIES

County	Location	Type	Miles
Mendocino-Sonoma	Cloverdale to Hopland	Grade and Surf.	13.9
Shasta	Hat Cr. Summit to Fall River Mills	Grade and Surf.	8.9
Calaveras	Near Angels Camp	Grade and Surf.	1.6
Santa Clara	Ware Ave. to Stephens Cr. Road	Grade and Pave.	3.4
Santa Clara	Stephens Creek Bridge	Bridge	
Lake-Colusa	Abbot Mine to 5 Mi. W. of Williams	Surface	19.1
Monterey	Rocky Creek	Bridge	
Nevada	Nevada City to Washington Road	Surface	11.8
Solano	City of Vallejo	Grade and Surface	0.3
Alpine	Near Lake Alpine	Grade and Surface	5.0
Solano	Cordelia to Fairfield	Grade and Pave.	5.7
Siskiyou	At Beaver Creek	Grade and Surface	0.5
Sacramento	Cosumnes River to McConnel	Grade and Pave.	1.5
Humboldt	East Branch Eel River Bridge	Grade and Surface	0.5

Some Projects for Last Six Months

Work to be advertised April 1, 1932, to December 31, 1932

SOUTHERN COUNTIES

County	Location	Type	Miles
Kern	Kern River	Bridge	-----
Kern	Bakersfield to Beardsley Canal	Pave.	2.9
Orange	In Fullerton	Pave.	1.9
Los Angeles	Santa Ynez Canyon to Santa Monica	Pave.	2.6
Los Angeles	Pomona to Los Angeles	Pave.	11.1
Los Angeles	Pomona to Brea Canyon	Pave.	6.0
Los Angeles	Through El Segundo	Pave.	2.0
Los Angeles	Pasadena to Monrovia	Pave.	3.6
Los Angeles	Jefferson Street to El Segundo	Structure	-----
Ventura	Ventura Northerly	Pave. and Bridge	1.0
San Bernardino	End of Pave. to Camp Waterman	Grade and Surf.	5.0
Riverside	Blythe to Colorado River	Grade and Surf.	4.1
Imperial	Sand Hills to 5 mi. W. of Yuma	Pave.	9.0
Mono	Bridgeport to Sonora Junction	Oil Rock Surf.	15.0
San Luis Obispo	Between Cambria and San Simeon	Bridges	-----
Orange	Anaheim Bay	Bridge	-----
Los Angeles	In Montebello	Pave.	1.5
Los Angeles	Topanga Canyon to Las Flores Canyon	Pave.	3.2

NORTHERN COUNTIES

County	Location	Type	Miles
Butte	Pulga to county line	Grade and Surf.	8.0
Santa Clara	Oregon Ave. to Alviso Road	Grade and Bit. Mac.	6.2
Santa Clara	Madrone Crossing	Grade separation	-----
Alameda	Dublin to Hayward	Pave.	9.5
Santa Clara } Santa Cruz }	Saratoga Gap to Black Road	Grade and Surf.	4.0
Contra Costa	San Pablo Cr. to Carquinez Br.	Pave.	9.6
Santa Cruz	Inspiration Point to Vine Hill Road	Grade and Surf.	6.5
Monterey	At Soledad	Grade separation and Ap.	1.2
Monterey	San Remo Divide to Carmel River	Grade and Surf.	3.4
Fresno	Fresno to Fancher Creek	Pave.	3.1
Sacramento	Sacramento to McConnell	Grade widening	11.0
San Joaquin	Nile Garden	Grade separation	-----
San Joaquin	Paradise Cut	Bridge	-----
Stanislaus	Stanislaus River	Bridge and Ap.	-----
Tuolumne	Sonora to $\frac{1}{2}$ mi. east	Grade and Surf.	-----
Amador	Drytown to Martell	Bit. Surf.	7.2

Now Licensed Structural Engineers

AMONG the forty-one registered Civil Engineers out of more than 5000 in the State who have thus far been passed by the Board of Registration as qualified to use the title Structural Engineer, are two members of the Architectural Division of the Department of Public Works in the office of State Architect George B. McDougall at Sacramento.



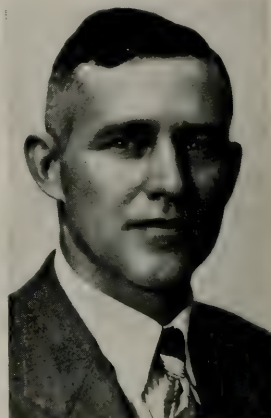
C. H. KROMER

They are Clarence H. Kromer, in charge of the Structural Section of the Division of Architecture, and D. C. Willett, Assistant in Charge. They are the only two men from the northern part of the State, exclusive of the San Francisco Bay district, who have thus far been so officially designated.

As evidence that the public is becoming more and more conscious of the responsibility placed in the hands of the men who design its more important buildings, there has been a growing demand that the law give more positive protection by stating that certain men are qualified and competent. The public rightly expects that these men shall be of assured competence

since it is life as well as property that must be guarded.

The State of California has long required that the architect be registered and a similar requirement was made of the civil engineer by legislative enactment in 1929—nearly five thousand engineers having been registered since this law was put into effect. However, since the safety of our building structures rests primarily with the structural engineer, greater protection is afforded the public by specifically designating those engineers who are known to be capable of assuming this responsibility.



D. C. WILLETT

With this in mind, the 1931 Legislature passed Assembly Bill No. 615 requiring that no person shall use the title "structural engineer" unless he be a registered civil engineer and unless he has been found qualified as a structural engineer by the Board of Registration for Civil Engineers. This bill was approved and signed by Governor Rolph thereby making California one of the pioneer states in assuring the public of safe buildings.

Good Roads Aid Gain In Park Attendance

Visitors in California's four national parks this year showed an increase of more than 50,000 over 1930, it is indicated in reports from Horace M. Albright, director of the National Park Service, reaching the Automobile Club of Southern California. A gain was registered over last year in each of these parks, and it is noted that more than 90 per cent of the travel to these outdoor recreation centers was in motor vehicles, made possible by improved highways.

There were 714,256 visitors in the four parks, an increase of over seven per cent.

Highway Courtesy a Factor in Safety

Highway courtesy, such as granting the right of way, signalling for turns and stops, having lights in proper adjustment, and remaining a safe distance behind the car ahead, will go far toward reducing the toll of deaths and injuries, according to a statement by the California Committee on Public Safety, which cites an analysis of driving faults which contributed to automobile accidents in support of the statement.

More than 30 per cent of those involved in accidents in 1930 did not have the right of way.

Unorthodox Mixture Makes Good Roads

(Continued from page 8)

back. So we left out the coal oil and heated both the sand and the road oil. And believe it or not asphalt stuck to the heated sand as if it belonged there. This mixture hardened at night, was fairly firm on a cloudy day but on a sunny day was nearly as soft as when first placed.

These combinations with road oil were obviously unsatisfactory but two months later when removed for the resurface they had not corrugated or displaced under traffic although they were still soft on sunny days.

COMBINATIONS TRIED

Endeavoring to obtain the best grading possible from the material, the beach sand was split into two sizes, $\frac{1}{4}$ to $\frac{1}{8}$ and $\frac{1}{8}$ to 0 and combined in various proportions with the yellow roadside sand.

The latter contained some fines passing a 200-mesh but the larger portion passed a 20 and was retained on a 40-mesh sieve. But little of the beach sand passed a 40-mesh sieve.

Various combinations of these three grades of sand were tried in the field experiments. Strangely enough every combination seemed to indicate by the surface area method that about 3.3 per cent of asphalt was required. The field tests indicated that the most stable mixture was obtained by the use of 50 per cent of the aggregate from $\frac{1}{4}$ " to $\frac{1}{8}$ " and about 25 per cent each of the two grades of sand. Increase in the amount of sand resulted in a mushy mixture and decrease in a porous mixture.

AVERAGE COMPARISONS

The average grading and asphaltic content of this combination compared with the specified grading for Type C asphalt concrete is as follows:

Sieve sizes	Per cent passing	
200	2.3	10%—20%
100	4.5	
80	7.3	35%—55%
40	19.4	60%—70%
20	31.6	
10	44.3	70%—90%
3	95.2	90%—100%
1	99.3	100%
	3.5	9%—15%

Obviously with round aggregate having such polished surfaces stability must be furnished by the asphalt for there is no mechanical locking of the aggregate. Since use of

aggregate from the beach required that the material be dried the same plant was necessary as for asphaltic concrete. It was therefore just as economical to use D grade asphalt and as this promised the greatest stability it was specified.

A condition contributing to the success of this type of construction is prevailing low temperatures in the area where it was used. Atmospheric temperatures above 70 degrees are rare and in July and August there is either high or low fog with little sunshine. Allowing for pavement temperatures 50 per cent in increase of atmospheric temperatures where the road is in sunshine for a major portion of the day, the pavement temperature would rarely if ever exceed 110 degrees.

TWO-INCH LAYERS

The average thickness of the asphalt treated surface is four inches. It was put down in two layers each thoroughly rolled. Experience indicated that satisfactory compaction was not obtained if the layers were much in excess of two inches in thickness.

Mineral aggregate was heated to about 35 degrees in the dryer and the mixture was spread on the road at a temperature of about 280 degrees. The hot material was spread and leveled by use of a combined spreader box, strike-off and leveling blades developed in this district and used by the contractors on other asphaltic jobs. No headers were used and no trouble was experienced in maintaining the edges of the surface.

A few rakers were necessary but blading was impracticable. The roller was able to work close to the spreader whereas with cut back mixes the roller has had to be kept from three to five hours behind the spreading.

The surface was made nonskid by application of the coarser aggregate, coated with asphalt as is customary.

The length of the job was 8.4 miles and the asphalt treated surface was twenty feet by four inches. Including the construction of shoulders two feet by four inches of selected material but exclusive of base reinforcement the improvement cost \$8,252 per mile.

At this writing there is every reason to believe that a satisfactory, safe and durable surface has been obtained at a low cost.

Highway Bids and Awards for December

HUMDOLDT COUNTY—Dyerville Bridge approaches, about 0.9 mile to be graded and surfaced with untreated crushed gravel or stone. Dist. I, Rt. 1, Secs. C. D. E, C. Coats, Sacramento, \$39,507; Baker and Taylor, Chester, \$47,645; Poulos and McEwen, Sacramento, \$53,685; Hemstreet & Bell, Marysville, \$33,041; Hein Bros.-Basalt Rock Co., Petaluma, \$40,186; Larsen Bros., Galt, \$34,997; Milton A. Purdy, San Francisco, \$40,867; Redwood Construction Co., Ltd., Eureka, \$38,863; Chas. N. Chittenden, Napa, \$47,842; Peter McHugh, San Francisco, \$47,829; Tieslau Bros., Berkeley, \$36,817. Contract awarded to Young & Son Co., Ltd., Berkeley, \$30,584.

LASSEN COUNTY—Between Willards and Susanville, about 9.2 miles to be graded and surfaced with crusher run base and bituminous treated crushed gravel or stone surface (plant mix). Dist. II, Rt. 29, Sec. B, Isbell Construction Co., Carson City, Nevada, \$266,295; A. Teichert & Son, Inc., Sacramento, \$249,335; Skeels & Graham, Roseville, \$245,677; Larsen Bros., Galt, \$244,731; Young and Son Co., Ltd., Berkeley, \$269,506; Hemstreet & Bell, Marysville, \$232,056; Dunn & Baker, Klamath Falls, Oregon, \$319,177; Peter McHugh, San Francisco, \$228,233; Contoules Construction Co., San Francisco, \$226,587; Force Construction Co., Piedmont, \$269,210; Southern California Roads Co., Los Angeles, \$245,247; Morrison-Knudsen Co., Boise, Idaho, \$243,182. Contract awarded to California Construction Co., San Francisco, \$217,937.

MADERA COUNTY—At Madera, about 0.6 mile to be graded and paved with Portland cement concrete. Dist. VI, Rt. 4, Sec. D, M. B. McGowan, Inc., San Francisco, \$33,759; Hartman Construction Co., Bakersfield, \$39,608; L. C. Clark and C. E. Doughty, Visalia, \$33,060; W. A. Dontanville, Salinas, \$32,600; D. McDonald, Sacramento, \$35,792. Contract awarded to Valley Paving and Construction Co., Fresno, \$31,554.

MENDOCINO COUNTY—Two reinforced concrete bridges, one across Big Dann Creek and one across Cedar Creek. Dist. I Rt. 1, Sec. J, Barrett & Hilp, San Francisco, \$236,122; Smith Bros. Co., Eureka, \$223,988; Lindgren & Swinerton, Inc., San Francisco, \$259,925; Mercer-Fraser Co., Eureka, \$246,380; Porter Bros., San Francisco, \$299,830; Rocca & Caletti, San Rafael, \$227,165; Peter McHugh, San Francisco, \$212,915. Contract awarded to Gutleben Bros., Oakland, \$208,248.

ORANGE COUNTY—Between Corona Del Mar and Laguna Beach, about 5.5 miles to be graded and paved with Portland cement concrete. Dist. VII, Rt. 60, Sec. B, Basich Bros., Torrance, \$407,470; Kovacevich & Price, Inc., South Gate, \$420,738; Gibbons and Reed Co., Burbank, \$497,294; Macco Construction Co., Clearwater, \$434,683; Peninsula Paving Co., San Francisco, \$466,450; Sander Pearson and Dimmitt & Taylor, Santa Monica, \$496,825; Griffith Company, Los Angeles, \$424,209; Daley Corporation, San Diego, \$444,051. Contract awarded to Jahn & Bressi Construction Co., Inc., Los Angeles, \$366,823.

SAN JOAQUIN COUNTY—Between 4.5 miles east of Lodi and 1.8 miles east of Clements, 8.4 miles grading and paving with asphalt concrete. Dist. X, Rt. 24, Secs. B & A, D. McDonald, Sacramento, \$137,922; Valley Paving & Construction Co., Fresno, \$149,972; Clark & Henery, San Francisco, \$159,046; Heafey-Moore, Oakland, \$160,645; C. W. Wood, Stockton, \$172,270; Larsen Bros., Galt, \$157,892; Hemstreet & Bell, Marysville, \$158,334; A. Teichert & Son, Sacramento, \$161,837; Fred W. Nighbert, Bakersfield, \$184,782. Contract awarded to Hanrahan Co., San Francisco, \$136,806.

SAN LUIS OBISPO COUNTY—Reinforced concrete girder bridges across Los Berros Creek and Arroyo Grande Creek. Dist. V, Rt. 2, Sec. F, Merritt-Chapman & Scott Corporation, San Pedro, \$43,747; M. B. McGowan, Inc., San Francisco, \$44,578; Theo. M. Maino, San Luis Obispo, \$42,390; Barrett & Hilp, San Francisco, \$47,546; Fredrickson & Watson Construction Co. and Fredrickson Bros., Oakland, \$42,606; Gist & Bell, Arcadia, \$46,575; B. A. Howkins & Co., San Francisco, \$49,170; Neves and Harp, Santa Clara, \$44,855. Contract awarded to Bodenhamer Construction Co., Oakland, \$41,774.

SAN MATEO COUNTY—Widening reinforced concrete slab bridge across Baden Creek near Baden. Dist. IV, Rt. 2, Sec. A, M. B. McGowan, San Francisco, \$5,640; Clinton-Stephenson Construction Co., Ltd., San Francisco, \$5,869; Vogt & Davidson, Ltd., San Francisco, \$6,153; A. W. Kitchen, San Francisco, \$5,523; Healy-Tibbitts Construction Co., San Francisco, \$5,730; John P. Lawlor, San Francisco, \$4,985. Contract awarded to W. L. Proctor, Santa Rosa, \$4,888.

SANTA BARBARA COUNTY—Two miles north of Solomon Summit to $\frac{1}{2}$ miles south of Santa Maria, about 6 miles to be graded and paved with Portland cement concrete. Dist. V, Rt. 2, Sec. L, Meyer Rosenberg, San Francisco, \$231,002; Peninsula Paving Co., San Francisco, \$201,439; M. J. Bevanda, Stockton, \$197,437; McCray Co., Los Angeles, \$207,794; Macco Construction Co., Clearwater, \$213,584; Basich Bros. Construction Co., Los Angeles, \$209,570; Granite Construction Co., Ltd., Watsonville, \$197,894; C. W. Wood, Stockton, \$199,900; Jahn & Bressi Construction Co., Inc., Los Angeles, \$213,426. Contract awarded to Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$188,811.

SHASTA COUNTY—Between Montgomery Creek and Burney, stockpiling crushed gravel or stone. Dist. II, Rt. 28, Sec. C, Hemstreet & Bell, Marysville, \$7,700. Contract awarded to James W. Bertram, Weott, \$6,700.

SISKIYOU COUNTY—Bridge across Cottonwood Creek about 21 miles north of Yreka, three 40-foot spans on concrete bents. Dist. II, Rt. 3, Section C, Rolla Arbuckle, Anderson, \$17,622; Robert Heaney, Hayward, \$18,120; Kuckenberg-Wittman Co., Inc., Portland, Oregon, \$18,330; M. B. McGowan, San Francisco, \$16,929; J. W. Hoopes, Sacramento, \$17,287; Dunn & Baker, Klamath Falls, Oregon, \$18,890; John Berlinger, Orland, \$21,450. Contract awarded to J. W. Halterman, Willows, \$16,372.

SISKIYOU COUNTY—Constructing Mt. Shasta Maintenance Station Buildings. Dist. II, Rt. 3, Sec. A, R. E. McKenzie, Red Bluff, \$7,400; L. Consentino, Dunsmuir, \$6,880; T. B. Goodwin, San Francisco, \$8,159; John W. Anderson, Mt. Shasta City, \$6,330; Oliver S. Almille, San Francisco, \$8,578; Theodor Johanns, San Francisco, \$7,610. Contract awarded to M. G. Still, Mt. Shasta City, \$5,750.

TRINITY COUNTY—Reinforced concrete bridge across Canyon Creek, 11 miles west of Weaverville, consisting of 5 40-foot spans. Dist. II, Rt. 20, Sec. F, Rolla Arbuckle, Anderson, \$22,509; Fred J. Maurer & Son, Eureka, \$24,432; Clinton-Stephenson Const. Co., San Francisco, \$23,263; R. B. McKenzie, Red Bluff, \$23,854; Nelson Bros., Escalon, \$26,229; F. H. Neilson, Orland, \$29,117. Contract awarded to John Berlinger, Orland, \$19,269.

Bevans Now Chief of Registration Bureau

Appointment of Russell Bevans, former chief inspector of the California Highway Patrol, as Registrar of the Division of Registration of the Department of Motor Vehicles, has been announced by Governor James Rolph, Jr.

Bevans had been acting registrar since last August. His appointment became final when Governor Rolph approved plans for reorganization of the department presented by Director Daniel J. O'Brien.

Prior to entering state service Bevans was a member of the San Francisco Police Department and was assigned to the mayor's office for three years.

Canada's roads have been built to a high standard and are equal to any in America.

WATER RESOURCES

*Official Report
As Of*

January 1, 1932

EDWARD HYATT, State Engineer

An interesting fact concerning the maintenance work on the Sacramento Flood control project disclosed in the monthly report of State Engineer Hyatt is that seven hundred men days labor at \$4 per day are required in clearing the Knights Landing Ridge Cut flowage area. The men are hired by the Yolo County supervisors and given ten days work each. An investigation of the underground basins or reservoirs in the South Coastal area, which the report says number twenty-nine in that section of southern California is being continued in connection with the collection of data concerning changes in the water plane. The report gives details of dam applications, and investigations in other areas of the State including reservoir sites on Piru Creek in Ventura County as follows:

IRRIGATION DISTRICTS

At the meeting of the California Districts Securities Commission on November 27, during the forenoon session, matters regarding the finances of Anderson-Cottonwood irrigation district were discussed by the Commission with various representatives of the district. During the afternoon session, similar matters were discussed with representatives of El Camino irrigation district.

A meeting of California Districts Securities Commission was held on December 11, 1931.

Visits for the purpose of considering matters in their interest were made to the following districts: Ramona, Lakeside, La Mesa, Lemon Grove and Spring Valley, and San Ysidro irrigation districts in San Diego County; Newport Heights and Newport Mesa irrigation districts in Orange County; Beaumont irrigation district in Riverside County; South Montebello, La Canada and Palmdale irrigation districts in Los Angeles County; Alpaugh irrigation district in Tulare County; Corcoran irrigation district in Kings County; and Oroville-Wyandotte irrigation district in Butte County.

DAMS

To date 788 applications have been received for approval of dams built prior to August 14, 1929; 88 applications for construction or enlargement, and 219 for repairs or alterations.

Applications Received for Approval of Plans for Construction of Dams.

Dam	Owner	County
Upper Hollywood El Capitan	City of Los Angeles City of San Diego	Los Angeles San Diego

Application received from the city of Los Angeles for construction of the Upper Hollywood dam, amending their application filed December 19, 1929, provides for an earthfill dam to store 193 acre-feet, 72 feet high.

The application for approval of plans of El Capitan dam states that the structure will be a combined hydraulic and rock fill dam 197 feet in height, to store 118,000 acre-feet at a cost of over three million dollars.

Applications Received for Approval of Plans for Repairs or Alterations.

Seventeen such applications were received during this period.

Plans Approved for Construction of Dams.

Dam	Owner	County
Looseley Pool El Capitan	T. H. Vestal, et al. City of San Diego	Lassen San Diego

Plans Approved for Repairs or Alterations.

Dam	Owner	County
Detert Lake Mocking Bird Sequoia Lake Webber Arch El Casco Filoli	Detert Estate Gage Canal Company Y. M. C. A. of Fresno El Dorado Irrigation District G. O. Trauzettel Filoli Inc.	Lake Riverside Fresno El Dorado Riverside San Mateo

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Maintenance clearing in the Sutter, Tisdale and Butte-Slough By-passes has been continued with three crews of twenty men each. These men are working on a five day limit, new crews being furnished by the registry office at Yuba City. This work will be continued approximately one month longer, or until heavy rains necessitate discontinuance.

Routine maintenance operations have been continued on all parts of the project. Good progress is being made in the lay-out and construction of a maintenance headquarters near Sutter City. The grading, concrete foundations and floors for the warehouse and shed have been completed. This work is being done with our own equipment and regular crew.

The clearing of the flowage area in the Knights Landing Ridge Cut, which was included as an item to be maintained by this Department by the last Legislature, commenced and will be completed early in January. About seven hundred men days labor are

Building Jetty With Five-Ton Rocks

(Continued from preceding page)

required. The men are hired through the Yolo County Board of Supervisors and work for ten days each at \$4 per day.

A herd of about 800 goats is pasturing on cut-over land in the lower Sutter By-Pass on a 200 acre tract. The goats are clearing this area in a very satisfactory manner. It is hoped that by next season herds totaling 3000 will be pastured on by-pass lands as an aid to keeping down the growth of timber.

Sacramento Flood Control Project.

The work of clearing the timber and brush opposite the openings in the Southern Pacific embankment in the Yolo By-pass west of Sacramento has been completed.

Clearing in Lower Sutter By-Pass under the contract with A. F. Johnston is approximately sixty per cent complete. Goats are also keeping this area clean of new growth.

Emergency Flood Protection and Rectification of Rivers.

Clearing of the channel of the Santa Ynez River, in cooperation with the county of Santa Barbara, commenced on December 6 and will be completed by January 1. A total of \$4,700 will be expended under the direction of Foreman James P. Kelley.

The work of continuing the river rectification on the San Jacinto River has continued under J. W. Sallee. This will be completed within ten days at a cost of about \$4,400.

Mokelumne River.

Clearing in the Mokelumne River channel in collaboration with San Joaquin County, under Chapter 447, Statutes of 1929, was completed on December 3. The total amount expended to date, including county funds, is approximately \$24,000.

Pajaro River.

Clearing of the channel of the Pajaro River, under Chapter 524, Statutes of 1929, was completed on November 23. This work was done in cooperation with the counties of Santa Cruz and Monterey.

Russian River Jetty.

Rock has been deposited in the jetty during the entire period along the new steel trestle at the outer end. The new equipment permits the handling of rocks weighing up to twelve tons. Most of the rock being placed, however, is of five-ton size or less, the larger rock being used for protective purposes. A crew of twelve men is engaged in this work.

Prior to December 15 some 1250 annual progress reports had been received from permittees and licensees. These reports are in process of examination and based upon the information contained therein extensions are being granted, or the projects are listed for field inspection next year wherever appropriate.

ADJUDICATIONS

Whitewater River (San Bernardino and Riverside counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

North Cow Creek (Sasta County). Case pending in Superior Court of Shasta County awaiting entry of the court's decree.

Oak Run Creek (Shasta County). Case pending in the Superior Court of Shasta County awaiting the entry of a decree in the North Cow Creek case.

Clover Creek (Shasta County). The Clover Creek case has been set for hearing January 18, 1932, in the Superior Court of Shasta County.

Mill Creek (Modoc County). Following filing of the Division's report as referee, on November 17, 1931, the court fixed December 7, 1931, as time for filing exceptions, and December 15, 1931, as date for hearing exceptions to report of referee and proposed decree.

Deep Creek (Modoc County). The Division's report covering the distribution of the waters of Deep Creek, in accordance with the trial schedule of allotments adopted for the 1931 season, has been completed for circulation among interested parties.

Franklin Creek (Modoc County). The Division's report on the distribution of the water of Franklin Creek for the 1931 season is about fifty per cent complete.

New Pine Creek (Modoc County). The report of the water supply and use of water on New Pine Creek, covering the field investigation conducted on that stream during the 1931 season, is being prepared.

Eagle Creek (Modoc County). The report on the water supply and use of water on Eagle Creek was completed on December 12, and is in the hands of the State Printing Office.

Pit River (Modoc and Lassen counties). The report on the supervision of diversion from Pit River in Hot Springs Valley is sixty-five per cent complete.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

During the past month work under this project has been confined almost entirely to office compilations and computations required in the preparation of the 1931 annual report presenting the results of all measurements of diversions, stream flow, return flow, use of water, salinity, etc.

The special field investigation to determine the extent of damage in the delta due to the 1931 water shortage and salinity, is still in progress.

WATER RIGHTS

Applications to Appropriate.

During the month of November, 20 applications to appropriate water were received, 17 were denied and 10 were approved. In the same period 12 permits and 2 licenses were revoked.

State Water Plan Map Distributed

(Continued from preceding page)

Although there have been some storms during the past month, there has been very little increase in the river flow at Sacramento which has remained at about 7000 second-feet throughout the month. This flow has been sufficient to gradually push the salinity out of the Sacramento Delta but the recession in the San Joaquin Delta has been extremely slow and almost imperceptible in some locations where "pocketing" exists. The recession permitted the discontinuance of the following stations during the month: Camp 33 Staten, Camp 7 Staten, Camp 25 Staten, Eagle Tree, Williams Bridge, Junction Point, Liberty Ferry, Isleton Bridge, Three-Mile Slough Bridge and Garwood Bridge. Sampling is still being maintained at 38 channel stations and six regular drainage stations. The accompanying table gives a comparison between the salinity at the middle of November and December of this year, and at the middle of December, 1924.

SALINITY—SACRAMENTO-SAN JOAQUIN DELTA

Station	Parts of Chlorine per 100,000		
	11/14/31	12/14/31	12/14/24
O. and A. Ferry-----	815		91
Collinsville-----	525	245	17
Emmerton-----	253	164*	6
Antioch-----	535	250	28
Webb Pump-----	185	91	34
Central Landing-----	73	34*	11
Middle River P. O.-----	193	100	21
Rindge Pump-----	84	56*	14

* December 10th.

CALIFORNIA COOPERATIVE SNOW SURVEYS

All field work in making arrangements for the coming season's snow surveys was completed last month and the work under this project during December has been in the office bringing up the long-time stream flow estimates, computing natural flow for the 1930-31 season and otherwise bringing all compilations up to date. The first surveys of the 1932 season will be made in the latter part of January when the "key" stations will be covered. The first bulletin of snow survey and precipitation data will be issued early in February.

WATER RESOURCES

South Coastal Basin.—This investigation has made marked progress during the year. The principal points on which it was concentrated were: First, data concerning changes in water plane gathered by the various interests in South Coastal Basin and by the Division of Water Resources in the past in order to make available in one central office this great mass of important information. The second line of work in the ratio of expenditures for the past year has been an investigation of the geology of the underground

basins of which there are approximately 29 in this section of southern California, each one of which may be considered an underground reservoir somewhat separated from the remainder although no surface signs may indicate such delimitation. This work will not be completed for some time yet. A third line of effort has been in the investigation of quality of water including local underground water, stream flows from the mountains, sewage water which may be used for irrigation and imported waters. This also goes into the matter of present and possible future salt water intrusion from the ocean and salt water intrusion into the pumping strata from oil wells not properly cased off from the salt water strata.

Mojave River Investigation.—During the year practically all the work on this investigation has been done by two branches of the Federal Government forces, the Geological Survey and the Department of Agriculture. The work has consisted of measuring stream flows and determining transpiration and evaporation losses caused by certain conditions of vegetation and ground water in parts of the Mojave River basin. The run-off for the year was very small.

Ventura County Investigation.—The appropriation of the State was increased from \$15,000 to \$25,000 for the biennium and this additional sum is being matched by the county. The usual work of stream measurements, percolation measurements and measurements of changes in water plane has been done throughout the year. The rainfall and run-off was small as it has been during the entire period of the investigation.

Additional hydrographic work consisting of investigation into the quality of underground water and of possible penetration of salt water from the ocean was started.

The increased appropriations by the State and the county were made primarily for investigation of geology of dam sites in the various streams of the county and for drilling of such sites. To date a geological examination has been made of all the dam sites and in the case of four of them has been checked by other geologists. The principal interest has lain in the reservoir sites on Piru Creek where there occurs a conflict between location for the State highway and use for reservoir purposes as to certain of the sites. To date three of these sites have been drilled with Diamond or Calyx drills.

Santa Ana Investigation—Construction Work.—General plans for work on Cucamonga Cone have been approved by the State Engineer as have detailed plans. This work is a part of that provided for under Chapter 640 of the Statutes of 1931, appropriating \$400,000 for the biennium to be made available when matched by local appropriations of local interest in San Bernardino County for construction of spreading and flood control works on the cones of the various streams of that county tributary to the Santa Ana River.

Pit River Investigation (Modoc and Lassen Counties).—Work on the report covering the three years investigation on the Pit River, October 1, 1928, to October 1, 1931, has been continued through-

(Continued on page 37)

Governor Rolph Takes Shovel in Hand To Start Four Public Buildings

1 1 1 1 1 1

IN THE past month Governor James Rolph, Jr., has participated in dedicatory and ground-breaking ceremonies at building projects of the Division of Architecture, Department of Public Works, in four counties.

These events took the Governor to widely separated parts of the State from Chico, Butte County, in the north, to Patton, San Bernardino County, in the south.

Governor Rolph began this series of functions by turning the first official shovelful of earth at the ground breaking for a large addition to the State Printing Plant in Sacramento on December 21st. The new Printing Plant Annex will be a three-story structure of steel and concrete.

HOSPITAL FOR VETERANS

At Yountville in Napa County on January 21st the Governor broke ground for a new hospital unit for the State Veterans' Home. The unit includes a group of four-story buildings consisting of an administration building, containing operating, laboratory and X-ray rooms; a ward building providing three 28-bed wards in addition to several smaller wards, baths and solarium; a service building containing large dining room, kitchen and cold storage plant.

The ceremonies on this occasion were most impressive and colorful. A military escort met the Governor on his arrival at the reservation gate at 3 p.m. Drawn up in review formation were massed colors with armed guards, the home band and post contingents of the G. A. R., Indian War Veterans, Spanish War Veterans, American Legion, Foreign War Veterans, Disabled Veterans of the World War and United Veterans of the Republic. The column filed in behind the Governor's automobile and escorted him to the site of the new hospital on Radio Hill for an impressive program arranged by Colonel Nelson M. Holderman, Commandant of Veterans' Home.

President Bruno A. Forsterer of the Board of Directors addressed the assemblage and presented Governor Rolph, whose address was followed by the ground-breaking ceremony.

NEW AUDITORIUM

A similar occasion took the Governor to Chico on January 22d for the ground-breaking and dedicatory ceremonies at the State Teachers College. The program included the dedication of a new concrete and steel auditorium and additions. The auditorium has a seating capacity of 1500 persons and is equipped with a large pipe organ, stage and dressing rooms, rest rooms, choral room and offices.

The ground-breaking ceremony took place at the site for a new Library Building. This structure will be of brick and concrete, two stories high and 135 x 165 feet in North Italian style of architecture. In addition to a large main reading room, reference room and stack room, it will provide rest rooms and offices.

DOUBLE CEREMONY

The next of these events in the Governor's itinerary required him to visit San Bernardino on January 25th where he officiated at the dedication of additions to the Patton State Hospital. The program included dedication of a new infirmary building of reinforced concrete having two large dormitories, dining room, kitchen and single rooms. The building is in the Spanish type of architecture and is most thoroughly equipped.

The program at Patton also included the dedication ceremonies for a group of fourteen employees' cottages each 49 x 26 feet of frame and stucco construction with two rooms, bath and porch.

The San Jose State Teachers College will claim Governor Rolph's presence on February 4th to dedicate its new Gymnasium Building and break ground for construction of a Natural Science Building.

DEDICATING GYMNASIUM

An appropriate program has been arranged by Dr. T. W. MacQuarrie, president of the college, and John Horning, president of the student body.

The gymnasium is a large concrete building 120 x 254 feet and is splendidly equipped with apparatus and facilities. The main gymnasium room has a seating capacity of from



WIELDS A WICKED SHOVEL.—Governor Ralph is becoming an expert in dirt digging through officiating at ground-breaking ceremonies. During the past month he participated in four such events in various parts of the State where the Architectural Division of the Department of Public Works has building projects under way. The above picture shows the Governor turning up the earth for an annex to the State Printing Plant at Sacramento. The bareheaded man in the center of the group is Director of Public Works Colonel Walter E. Garrison. Deputy Director James I. Herz is on the right and on the left is Superintendent J. M. Welsh of the Printing Plant.

2300 to 3000 persons and is surrounded by a large balcony. This building also contains a 25x75-foot swimming pool, dressing rooms for men and women, showers, boxing and wrestling rooms. After the dedication exercises at the gymnasium the audience will move out of the building to the site for the new science building where Governor Ralph will perform the ground-breaking ceremony.

The Natural Science Building will be of concrete construction and will be built in an "L" shape 200 x 75 feet by 103 x 73 and will be in the Italian style. It will contain lecture, physical, chemical, botanical and zoological rooms in addition to preparation rooms and offices.

USING CARS AND ROADS

Gasoline shipments for automobile use increased to 1,340,000 carloads during 1931, as compared with 1,330,000 carloads in 1930, according to figures reported to the California State Automobile Association. The increase is evidence that motorists continued using their cars in spite of general conditions. The freight revenue from these shipments was approximately \$220,000,000.

BUILDING SAFETY INTO SUPER-HIGHWAY BY DOUBLE BRIDGE GRADE SEPARATION

(Continued from page 23)

and of the approach fills, borings over fifty feet in depth were made into the mud bottom.

Suffice it to say, that an economical engineering solution to the problem has been found. The super-highway will not be depressed but will have a high and dry level grade and the tracks and Culver Boulevard will be elevated. Traffic will rely on other by-pass roads in proceeding from one boulevard to the other.

Stairways and sidewalks will be provided for pedestrians and those desiring to make use of train service. In addition to a sixty foot clear vehicular roadway width, which is the width used on all structures mentioned above, there will be additional width to take care of sidewalk construction.

The building of this structure which will eliminate interference and hazard will mean much to the people of the State who travel this super-highway.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 JANUARY, 1932 No. 1

"Splendid Piece of Work," Says Editor

The splendid road which the State Department of Public Works is building up the Yuba from Indian Valley will, when completed, be a tribute to Governor Rolph's administration. Although the work seems to be progressing slowly, owing to the large amount of rock encountered, when completed a beautiful, broad boulevard will be the result, one of the most scenic drives in this part of the State.

The way the kinks are being taken out of that crooked road is a thing to be marveled at by the layman, and the width is already a joy to one traveling over the completed portion. Everything else being equal, Superintendent Irish is to be congratulated on building a splendid highway.

The news published last week to the effect that the Rolph administration will continue this important work is most gratifying to the people of Sierra County. For such a highway to lead into Downieville from the west would be something of which our people could be justly proud.—*Downieville Messenger*.

LOOK WHAT'S COMING!

Regardless of the improvements made since the automobile was first introduced, the end is not yet, according to a statement reaching the Automobile Club of Southern California from a leading automobile engineer.

What the builders are figuring on is indicated in this forecast, which says:

"Within ten years we'll have automobiles safely traveling 100 miles an hour, weighing less than 1000 pounds, costing less than \$1,000, and covering 80 miles on a gallon of gas."

A sum of approximately \$2,250,000,000 was expended for the construction and maintenance of streets and highways in the United States during 1931, providing direct or indirect employment to more than one million persons.

Keeping Mountain Pass Open Called An Epochal Feat

LAST Saturday and Sunday it was our great pleasure to ride over the highway between Colfax and Truckee, and it is seldom that an opportunity to view such stupendous grandeur has been afforded us. Living as we have done for the past twenty years, in a country either adjacent to or right in the snow region of California, we feel we speak with some degree of knowledge of the subject. When we say that the California Department of Public Works, and their employees, have accomplished a feat of mammoth proportions we are indeed putting it mildly.

Never have we witnessed a sight more beautiful. As one approaches the summit of the Sierra Nevada Mountains, between banks of snow from four to fifteen feet in depth through which a double lane has been cut, leaving perpendicular banks of downy white on either side, it is with a feeling of awe and a somewhat indefinite understanding of the magnitude of the accomplishment. Then dropping over the summit looking down on Donner Lake, frozen over with a thin coating of ice, lying as it does at the base of precipitous mountains, a beautiful jewel in nature's diademed crown, the stupendous grandeur more forcibly awakens the insignificance of man. Yet beside this same feeling of insignificance is one of accomplishment because, for the first time in history, man has conquered the elements, on the highways of this mountain pass.

This year with such a tremendous task, aggravated by the extremely heavy fall of snow, it is truly an accomplishment worthy of recording. It is one of the greatest single feats in the history of modern man, in his struggle to conquer the elements.

Yes, the conquering of the Summit Highway, will mean much to the future economic life of central California. But aside from the great benefit that will accrue economically there is moral lesson, worthy of the closest attention and consideration. It is this that time, patience and perseverance will accomplish all things.—*Auburn Journal-Republican*.

During the calendar year of 1931, 1,588,428 persons camped or picknicked at the 1252 public camps maintained in the national forests of the State. It is estimated that at least as many more visited the resorts, private camps, and summer homes located within the forests.

Slight Increase in Sacramento Flow

(Continued from page 33)

out the present month and is approximately fifty per cent complete.

Napa Valley Investigation.—This investigation has continued throughout the month in a routine manner having as its object a determination of the waste from Napa River, the relative contributions of Napa River proper, Conn Creek and Rector Creek, the percolation losses and accretions in the lower reaches of these streams and the behavior of ground water in this area.

STATE WATER PLAN

A meeting of the California Water Resources Commission was scheduled to be held during the early part of December, but due to the untimely death of Commissioner W. B. Mathews, postponement was taken out of respect to the memory of this able, energetic commissioner and valued citizen of California.

On December 10 and 11 the Honorary Advisory Committee of Engineers met in the State Building, Civic Center, San Francisco, for discussions in connection with their review of engineering data bearing on all projects proposed under the State Water Plan.

In response to numerous inquiries from the public for information relating to the State Water Plan, a map of California, four by six feet in size, was

prepared by the Division. This map delineates the Major Units of the State Plan for Development of Water Resources of California. Distribution of the map has been made for the purpose of portraying the proposed projects for use at public gatherings and for the use of organizations that have undertaken analytical study of the State Water Plan as a whole.

Advance mimeographed copies of the following reports have been prepared and submitted to our consultants and the Honorary Committee of Engineers appointed by the Governor.

Bulletin 26, "Sacramento River Basin."

Bulletin 27, "Variation and Control of Salinity in Sacramento-San Joaquin Delta and Upper San Francisco Bay."

Bulletin 29, "San Joaquin River Basin."

The text of Bulletin 28, "Economic Aspects of a Salt Water Barrier Below the Confluence of the Sacramento and San Joaquin Rivers," has been submitted to the State Printer for publication and distribution at an early date. Thus the completion of the series of reports on the water resources investigation, authorized under Chapter 832, Statutes of 1929, is rapidly drawing to conclusion.

Studies are being continued by the California Water Resources Commission and the Joint Legislative Water Committee on a tentative draft of a proposed constitutional amendment under which, it is hoped, the State Plan may proceed to realization.

Highway Men Elected By State Employees

Paul O. Harding, who has been elected president of the California State Employees Association for the year 1932 is an Associate Highway Engineer in District IV of the Division of Highways, San Francisco. He was an active member of the State Employees Retirement Campaign Committee which supervised the campaign for the Retirement Act, and during 1931 was also a member of the Civil Service and Legislative Committees of the State Association, as well as president of the District IV chapter located in San Francisco.

C. E. O'Connell, who has been chosen as treasurer, is the chief clerk for District VIII of the Division of Highways located at San Bernardino. During 1931 he was president of the San Bernardino chapter, a position to which he has been reelected for 1932. During 1931 he was also chairman of the Auditing Committee of the State Association.

Gordon Zander, Supervising Engineer for the Division of Water Resources, Sacramento,

was selected as chairman of the Civil Service Committee for 1932. Mr. Zander has been active in employee association matters in the Sacramento chapter, of which he is a member.

COMMON COUNCIL SENDS RESOLUTION OF THANKS

BE IT RESOLVED by the Common Council of the city of San Diego, as follows:

That an expression of appreciation of this body be and it is hereby extended to the Hon. Edward Hyatt, State Engineer, for his courtesy in advancing action on the plans for the dam which the city of San Diego contemplates erecting at El Capitan Dam Site, and

The City Clerk is hereby directed to transmit a copy of this resolution to Mr. Hyatt.

I HEREBY CERTIFY the above to be a full, true, and correct copy of Resolution No. 57671 of the Common Council of the city of San Diego, as adopted by the said Council December 14, 1931.

(Signed) ALLEN H. WRIGHT,
City Clerk.
CLARK M. FOOTE, JR.,
Deputy.

Highway Builders Tamed the Desert in Giving Imperial Valley Roads

There's romance everywhere if you look for it—even in road building. Down in the Imperial Valley there was plenty of it, sometimes tinged with tragedy for the pioneer highway workers battling with the drifting sands and fierce heat of the desert to build roads over which citizens of the State and visiting tourists could travel quickly and safely.

Some interesting features of this part of the valley's history are touched on in the following article describing some improvements effected by the Department of Public Works since the first of the year.

By I. A. (TOMMY) THOMAS, Maintenance Superintendent, District VIII, Division of Highways

THIRTY years ago Imperial Valley was the most forbidding place in the United States, known as the graveyard of adventure, where none could survive the stretches of desert. Then, water was brought into the valley from the Colorado River, and within six years the same valley was, by vote of the people, created into a county. This was less than twenty-five years ago. Of course, there was not a single State road in the whole Imperial County in 1907. It took a week to drive to Los Angeles, and the smoothest, speediest conveyance was the train out of Imperial Junction on the main line of the Southern Pacific Railroad.

Today, the network of State highways permits the autoist to reach San Diego, Los Angeles and San Francisco, through Yuma, without leaving paved highways.

The first piece of concrete roadway was laid in 1915. It was four inches thick and sixteen feet wide, starting at Meyers Creek, thence to Coyote Wells, Dixieland and finally reached El Centro. Before this road was constructed, it took all of twelve hours to reach San Diego from El Centro. It was an occasion for first page news if any one negotiated the distance in less time than that. In fact, at the creek, it was necessary for the occupants of six machines to get into a huddle in order to push the cars through the sands. It was too bad for the autoist who rode "lone wolf." He was doomed to remain there in the sands until relief came.

Now, after the completion of the twenty-foot wide pavement, the motorist drives through scenic beauty, across the path where Kearny marched his small cavalry army, through the grizzled rocks that have been smoothed by the blasts of sand blown against them for ages, through natural sulphur springs in the Jacumbas, up to the Pines, then to the frontiers of the shed used by San Diego for its present water supply, and into the vale where the climate is the most equable in the world. The trip from El Centro, the county seat of Imperial County, to San Diego can now be made comfortably in three hours.

REAL ROAD ROMANCE

Some day the gripping romance of the building of the State Highway System, which connects Los Angeles with the heart of Imperial County, will be written. It will be written by the young engineers starting now with the Highway Department of Public Works. They will be able to trace the paths of the first pavement placed across the section from Oasis, at the boundary line between Riverside and Imperial counties, to Westmoreland, the



I. A. THOMAS

first cultivated place in Imperial County, approached on the highway known as U. S. 99.

The first road there seemed destined to last one day and be a one-way highway. Shifting sands would cover the paths, cut backs from the Salton Sea would crack up and move parts, leaving deep ruts. In the event of a rain—an unusual feature—the whole section would be impassable.

I. A. Thomas Tells About Road Work In Imperial Valley

(Continued from preceding page)

These young men now with the department will marvel at the hardiness displayed by E. Q. Sullivan, engineer, District VIII, who for two years studied the drifts of the sands, the wind directions, in what is now the cut through the Sand Hills, leading around Pilot Knob and into Yuma. Here was a true sentinel of the desert, and because of his observations, a real paved highway was built, where before there was a dangerous plank road, and before that no road at all.

The Division of Highways is now building a road through the Yuma Indian Reservation, avoiding many sharp curves and grades.

PAVEMENT WIDENED

To mention only a few of the sections where additions were started and completed this year, the following are typical examples of improvements. On the U. S. 80 highway (connecting San Diego with El Centro and thence to Yuma) a new asphalt pavement running 16.5 miles east from the San Diego-Imperial County line, and from that point extending 27 miles east a new twenty-foot asphalt pavement, was laid over the old concrete road. To correct a fault in the highway between El Centro and Holtville, a new twenty-foot cement pavement covering 6.5 miles was laid over the old oil road.

A departure from the old type road building was made, when the highway, leading from Holtville, to the Highline Canal of the irrigation system, was built three feet higher than the old roadbed, thus preventing cracking of the surface through overflows or seepage under the road. Engineers consider this one of the best constructed pieces of roadway in its class.

And, to make the work complete, and safe, the highway through the desert, from the Highline Canal, to the sand dunes, was widened from fifteen feet to a twenty-foot roadway. From the sand dunes into Yuma the new line change is being made as mentioned previously.

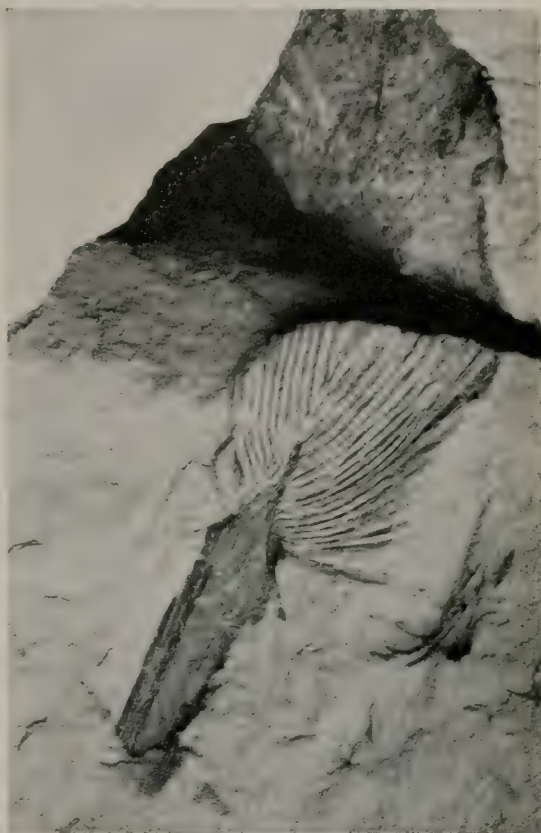
BELOW SEA LEVEL

No one can fail to feel awe while traveling over the U. S. 99, along the Salton Sea. This road in Imperial County is all below sea level. On the sides of the hills to the west of the highway, the former sea level markings are plainly visible. Nature plays pranks with the vision. An inland sea, wholly below sea level, stretches for thirty miles to the east of the highway and there are no seeming inlets or outlets. The Salton Sea was formed wholly from the overflow of the Colorado River in 1905-1906, and is constantly replenished from surplus irrigation water.

At the very spot of greatest depth of the Salton Sea was located a salt works owned by Liverpool people. That was in 1904-5. It was then called the Salton Sink and cattle brought through the San Geronio Pass grazed in the Sink. The first tracks laid by the Southern Pacific Company ran across the Sink between Flowing Wells and Thermal. Now all these are covered by the Salton Sea.

A bee can rise with three times its own weight, says an insectologist. Yes, and sit down with about 300 times its own weight.—*Thomaston Times*.

Palm Leaf Fossil Unearthed on Ridge



A PREHISTORIC RECORD was brought to light by excavators on the Ridge Route Alternate in Los Angeles County when they found the perfect print of a huge palm leaf in a blasted rock thirty feet below the canyon surface.

A discovery has been made while excavating on the new Ridge Route Alternate in Los Angeles County which gives some insight into plant and climatic conditions existing in prehistoric times in that section of California.

Near Bridge Canyon, 6½ miles north of Castaic School, the fossilized imprint of a palm leaf was found embedded in sandstone. The depth at which this fossil was found has been estimated at from 25 to 30 feet below the present ground surface.

Traces of the tip of the leaf and a portion of the stem had been obliterated, probably by blasting operations preceding the discovery of the imprint. The part found was approximately 3½ feet long and 1½ feet wide across the leaf and closely resembles the leaves of palm trees now growing in the vicinity of Los Angeles.

December Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of December, 1931.

YUBA COUNTY—Application 7130. Andrew J. Thickstun, Clipper Mills, for 50 c.f.s. from Slate Creek, tributary to N. Fork of Yuba River to be diverted in Section 10, T. 19 N., R. 8 E., M. D. B. and M., for mining purposes. Estimated cost \$5,000.

INYO COUNTY—Application 7131. Panyo Gold, Ltd., 427 S. McCadden Place, Los Angeles, for 1.0 c.f.s. from Jail Canyon Stream tributary to N. stream to be diverted in Section 14, T. 20 S., R. 44 E., M. D. B. and M., for mining, milling and domestic. Estimated cost \$575.

SAN MATEO COUNTY—Application 7132. State Subsidiary, Ltd., Trustee for Cuesta La Honda, Inc., 775 Market St., San Francisco, for 0.02 c.f.s. and 55 acre-feet per annum from Woodhams Creek tributary to La Honda & San Gregorio Creek, to be diverted in Section 13, T. 7 S., R. 4 W., M. D. B. and M., for domestic purposes. Estimated cost \$15,000.

TUOLUMNE COUNTY—Application 7133. Russell Grigsby, Hotel Terry, Stockton, for 200 acre-feet per annum from Eagle Creek tributary to Stanislaus River to be diverted in Section 3, T. 3 N., R. 16 E., M. D. B. and M., for recreational purposes. Estimated cost \$3,000.

FRESNO COUNTY—Application 7134. City of Fresno, care Claude L. Rowe, City Attorney, Fresno, for 200 c.f.s. from San Joaquin River tributary to Suisun Bay to be diverted in Section 5, T. 11 S., R. 21 E., M. D. B. and M., for municipal purposes. Estimated cost \$10,000,000.

FRESNO COUNTY—Application 7135. City of Fresno, care Claude L. Rowe, City Attorney, Fresno, for 40 c.f.s. from San Joaquin River tributary to Suisun Bay to be diverted in Section 5, T. 11 S., R. 21 E., M. D. B. and M., for irrigation purposes (11,488 acres). Estimated cost \$10,000,000.

LOS ANGELES COUNTY—Application 7136. G. H. Burkhardt, 2681 Longwood Ave., Los Angeles, for 350 acre-feet per annum from Middle Fork of Palmet Creek tributary to Big Rock Creek to be diverted in Section 23, T. 4 N., R. 10 W., S. B. B. and M., for irrigation and domestic purposes (150 acres).

HUMBOLDT COUNTY—Application 7137. Ed. Pratt, Hoopa, for 1.0 c.f.s. from Red Cap Creek tributary to Mill Creek, thence Klamath River to be diverted in Section 14, T. 9 N., R. 5 E., H. B. and M., for mining purposes. Estimated cost \$15.

SIERRA COUNTY—Application 7138. The Judson Estate Co., a Corporation, care Geo. F. Taylor, Downieville, for (1) 25 c.f.s. (2) 25 c.f.s. total 50 c.f.s. from (1) Lovers Ravine (2) Bald Mountain Ravine tributary to Slate Creek and N. Fork Yuba River to be diverted in Section 33, T. 21 N., R. 9 E., M. D. B. and M., for mining purposes. Estimated cost \$15,000.

LOS ANGELES COUNTY—Application 7139. State of California, Department of Public Works, Division of Highways, care C. H. Purcell, State Highway Engineer, Public Works Building, Sacramento, for 0.05 c.f.s. from Unnamed Spring tributary to Piru Creek to be diverted in Section 30, T. 6 N., R. 17 W., S. B. B. and M., for industrial and domestic and incidental irrigation.

SANTA CLARA COUNTY—Application 7140. Santa Clara Valley Water Conservation District, care Fred H. Tibbetts, Alaska Commercial Building, San Francisco, for 40,000 acre-feet per annum from Coyote River tributary to San Francisco Bay to be diverted in Section 10, T. 9 S., R. 3 E., M. D. B. and M., for irrigation and domestic purposes (133,000 acres). Estimated cost \$1,000,000.

SANTA CLARA COUNTY—Application 7141. Santa Clara Valley Water Conservation District, care Fred H. Tibbetts, Alaska Commercial Building, San Francisco, for 2500 acre-feet per annum from Almaden Creek tributary to Alamitos and Guadalupe Creek to be diverted in Section 10, T. 9 S., R. 1 E., M. D. B.

and M., for irrigation and domestic (133,000 acres). Estimated cost \$135,000.

SANTA CLARA COUNTY—Application 7142. Santa Clara Valley Water Conservation District, care Fred H. Tibbetts, Alaska Commercial Building, San Francisco, for 3500 acre-feet per annum from Guadalupe Creek tributary to San Francisco Bay to be diverted in Section 19, T. 8 S., R. 1 E., M. D. B. and M., for irrigation and domestic purposes (133,000). Estimated cost \$377,170.

SANTA CLARA COUNTY—Application 7143. Santa Clara Valley Water Conservation District, care Fred H. Tibbetts, Alaska Commercial Building, San Francisco, for 4000 acre-feet per annum from Stevens Creek tributary to San Francisco Bay to be diverted in Section 27, T. 7 S., R. 2 W., M. D. B. and M., for irrigation and domestic purposes (133,000 acres). Estimated cost \$350,000.

LOS ANGELES COUNTY—Application 7144. Truman K. Temple, Box 4, Upland, for 5 c.f.s. from Mescal Creek to be diverted in Section 15, T. 4 N., R. 8 W., S. B. B. and M., for irrigation and domestic purposes (180 acres). Estimated cost \$1,700.

EL DORADO COUNTY—Application 7145. B. W. Stone, 161 Ellis St., San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River (2) Pilot Creek (3) Gerle Creek (4) Loon Lake (5) Buck Is. Lake (6) Rock Bound Lake (7) Little S. Fork Rubicon River tributary to American River Drainage Area to be diverted in Section 9, T. 13 N., R. 16 E., M. D. B. and M., Section 11, T. 12 N., R. 12 E., M. D. B. and M., Section 24, T. 13 N., R. 13 E., M. D. B. and M., Sections 11, 31 and 34, T. 14 N., R. 14 E., M. D. B. and M., Section 4, T. 13 N., R. 15 E., M. D. B. and M., and Section 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

TRINITY COUNTY—Application 7146. D. G. Turnbull, Weaverville, for 25 c.f.s. from NE. Fork of Van Ness Creek (Feeney Creek) tributary to Van Ness Creek, thence Trinity River to be diverted in Section 20, T. 35 N., R. 7 W., M. D. B. and M., for mining purposes. Estimated cost \$5,000.

LOS ANGELES COUNTY—Application 7147. Division of Highways, Department of Public Works, State of California, P. O. Box 1103, Sacramento, for 2600 gallons per day from Read Spring tributary to Piru Creek to be diverted in Section 4, T. 6 N., R. 18 W., S. B. B. and M., for industrial, domestic and incidental irrigation purposes. Estimated cost \$1,500.

LOS ANGELES COUNTY—Application 7148. Division of Highways, Department of Public Works, State of California, Box 1103, Sacramento, for 0.008 c.f.s. from Templeton Spring tributary to Piru Creek to be diverted in Section 12, T. 6 N., R. 18 W., S. B. B. and M., for industrial, domestic and incidental irrigation purposes. Estimated cost \$1,000.

AMADOR COUNTY—Application 7149. State of California, Department of Public Works, Division of Highways, care C. H. Purcell, State Highway Engineer, Public Works Building, Sacramento, for 0.016 c.f.s. from unnamed spring tributary to Bear River, thence N. Fork Mokelumne River to be diverted in Section 16, T. 9 N., R. 16 E., M. D. B. and M., for domestic purposes. Estimated cost \$750.

EL DORADO COUNTY—Application 7150. State of California, Department of Public Works, Division of Highways, care C. H. Purcell, State Highway Engineer, Public Works Building, Sacramento, for 0.007 c.f.s. from Tragedy Springs tributary to Bear River, thence N. Fork Mokelumne River to be diverted in Section 7, T. 9 N., R. 17 E., M. D. B. and M., for recreational purposes. Estimated cost \$450.

SAN LUIS OBISPO COUNTY—Application 7151. City of San Luis Obispo, care Athearn, Chandler and Farmer and Frank R. Devlin, 723 Balboa Building, San Francisco, for 4 c.f.s. from Lopez Creek tributary to Arroyo Grande Creek to be diverted in Section 9, T. 31 S., R. 14 E., M. D. B. and M., for municipal purposes.

SAN LUIS OBISPO COUNTY—Application 7152. City of San Luis Obispo, care Athearn, Chandler and Farmer and Frank R. Devlin, 723 Balboa Building, San Francisco, for 6098 acre-feet per annum from Lopez

Permits to Appropriate Water Issued

Continued from preceding page

Creek tributary to Arroyo Grande Creek to be diverted in Sections 21, 22, 26, 36, T. 30 S., R. 13 E., M. D. B. and M., and Section 31, T. 30 S., R. 14 E., M. D. B. and M., and Sections 6, 16 and 21, T. 31 S., R. 14 E., M. D. B. and M., for municipal purposes.

ALAMEDA COUNTY—Application 7153. Sisters of the Sacred Names of Jesus and Mary, a corp., care Hatfield Wood and Kilkenny, Chancery Building, San Francisco, for 0.50 c.f.s. and 80 acre-feet per annum from Laurel Creek and Agua Caliente Creek tributary to San Francisco to be diverted in Section 18, T. 5 S., R. 1 E., M. D. B. and M., for irrigation purposes (107 acres). Estimated cost \$2,500.

ALAMEDA COUNTY—Application 7154. Sisters of the Sacred Names of Jesus and Mary, a corp., care Hatfield Wood and Kilkenny, Chancery Building, San Francisco, for 24 c.f.s. from Laurel Spring and Sulphur Spring tributary to Arroyo Agua Caliente and San Francisco Bay to be diverted in Sections 8 and 18, T. 5 S., R. 1 E., M. D. B. and M., for domestic purposes. Estimated cost \$8,000.

TEHAMA COUNTY—Application 7155. W. W. Hoy, Agent for First National Bank, Trust Department, Santa Ana, for 15 acre-feet per annum from South Fork Battle Creek tributary to Battle Creek, thence Sacramento River to be diverted in Section 8, T. 29 N., R. 4 E., M. D. B. and M., for recreational purposes.

TEHAMA COUNTY—Application 7156. Lassen Volcanic National Park, Dept. of Interior, care L. W. Collins, Supt., Mineral, for 0.5 c.f.s. from unnamed spring tributary to Battle Creek, thence Sacramento River to be diverted in Section 25, T. 29 N., R. 3 E., M. D. B. and M., for domestic, industrial and fire protection purposes.

EL DORADO COUNTY—Application 7157. H. L. Fowler, Georgetown, for 9 c.f.s. from Pilot Creek tributary to Rubicon River to be diverted in Section 4, T. 12 N., R. 12 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$5,000.

SANTA BARBARA COUNTY—Application 7158. Mrs. Stanley McCormick, Mr. Harold F. McCormick, Continental Illinois Bank & Trust Co., Chicago, Conservators for Mr. Stanley McCormick, care Salisbury, Bradshaw & Taylor, Petroleum Securities Building, Los Angeles, for 2.4 c.f.s. 100 acre-feet per annum, from Cold Spring Creek tributary to Pacific Ocean to be diverted in Section 7, T. 4 N., R. 26 W., S. B. B. and M., for irrigation and domestic purposes (85 acres). Estimated cost \$1,500.

SANTA BARBARA COUNTY—Application 7159. Mrs. Stanley McCormick, Mr. Harold F. McCormick, Continental Illinois Bank & Trust Co., Chicago, Conservators for Mr. Stanley McCormick, care Salisbury, Bradshaw & Taylor, Petroleum Securities Building, Los Angeles, for 0.8 c.f.s. 20 acre-feet per annum, from Hot Spring Creek tributary to Cold Spring Creek to be diverted in Section 7, T. 4 N., R. 26 W., S. B. B. and M., for irrigation and domestic purposes (85 acres). Estimated cost \$100.

SAN MATEO COUNTY—Application 7160. State Subsidiary, Ltd., Trustee for Cuesta La Honda, Inc., 775 Market St., San Francisco, for 0.40 c.f.s. from La Honda Creek tributary to San Gregorio Creek to be diverted in Section 14, T. 7 S., R. 4 W., M. D. B. and M., for recreational and domestic purposes. Estimated cost \$5,000.

MONO COUNTY—Application 7161. Herbert W. Ross, 713 Crescent Drive, Beverly Hills, for 200 gallons per day from small stream tributary to Twin Lakes thence Mammoth Creek, Hot Creek and Owens River to be diverted in Section 9, T. 4 S., R. 27 E., M. D. B. and M., for domestic purposes. Estimated cost \$39.

LOS ANGELES COUNTY—Application 7162. F. R. Fancher, 217 Emerald St., Redondo Beach, for 0.001 c.f.s. from 2 unnamed springs tributary to Big Santa Anita, thence San Gabriel River to be diverted in Section 3, T. 1 N., R. 11 W., S. B. B. and M., for domestic purposes. Estimated cost \$50.

SAN BERNARDINO COUNTY—Application 7163. Frank P. Meeker, Cucamonga, for 0.5 c.f.s. from Natural flow and waste water taken in road gutter tributary to Santa Ana River Watershed to be

diverted in Section 2, T. 1 S., R. 7 W., S. B. B. and M., for irrigation purposes (40 acres). Estimated cost \$500.

EL DORADO COUNTY—Application 7164. Vern W. Drake, Greenwood, for 1.0 c.f.s. from Jackass and Orillo Creek tributary to Greenwood Creek, thence S. Fork American River to be diverted in Section 7, T. 12 N., R. 10 E., M. D. B. and M., for mining purposes. Estimated cost \$25.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of December, 1931.

EL DORADO COUNTY—Permit 3822, Application 6997. W. H. Welch (forward to Twin Bridges, care Spencers Store), Kyburz, December 1, 1931, for 4.0 c.f.s. from Pyramid Creek tributary to So. Fork American River in Section 8, T. 11 N., R. 17 E., M. D. B. and M., for use for power and domestic. Estimated cost \$100.

INYO COUNTY—Permit 3823, Application 7000. E. Hague and M. A. Streger, Box 444, Trona, December 8, 1931, for 0.025 c.f.s. from Redland Springs tributary to Great Panamint Desert in Section 18, T. 23 S., R. 45 E., M. D. B. and M., for use for mining and domestic. Estimated cost \$2,000.

HUMBOLDT COUNTY—Permit 3824, Application 7034. James L. Skiffington, Dyerville, Humboldt Co., December 8, 1931, for 7760 gallons per day from Little Creek tributary to Bull Creek, thence to So. Fk. Eel River and Eel River in Section 19, T. 1 S., R. 2 E., H. B. and M., for use for domestic and recreational.

TUOLUMNE COUNTY—Permit 3825, Application 7058. U. S. Stanislaus National Forest, Sonora, Tuolumne Co., December 8, 1931, for 0.1 c.f.s. from No. Fork Tuolumne River tributary to Tuolumne River in Section 22, T. 4 N., R. 18 E., M. D. B. and M., for use for domestic purposes. Estimated cost \$5,000.

HUMBOLDT COUNTY—Permit 3826, Application 7064. Humboldt Creamery Association, Fernbridge, Humboldt County, December 10, 1931, for 0.22 c.f.s. from Eel River tributary to Pacific Ocean in Section 29, T. 3 N., R. 1 W., H. B. and M., for use for irrigation of 1 acre and creamery purposes. Estimated cost \$500.

HUMBOLDT COUNTY—Permit 3827, Application 6835. Benbow Power Co., Benbow, Humboldt Co., December 12, 1931, for 320 c.f.s. from S. Fork of Eel River tributary to Eel River in Section 36, T. 4 S., R. 3 E., H. B. and M., for use for hydroelectric power. Estimated cost \$50,000.

KERN COUNTY—Permit 3828, Application 7015. County of Kern, Bakersfield, December 12, 1931, for 0.4 c.f.s. from two springs tributary to Cedar Creek drainage area; thence to Poso Creek in Section 29, T. 25 S., R. 32 E., M. D. B. and M., for use for domestic purposes.

SONOMA COUNTY—Permit 3829, Application 6944. Sonoma State Home, Eldridge, Sonoma Co., December 15, 1931, for 0.55 c.f.s. and 250 acre-feet from Sonoma Creek tributary to San Pablo Bay in Section 22, T. 6 N., R. 6 W., M. D. B. and M., for use for domestic purposes and irrigation 110 acres of general crops and 20 acres of lawn. Estimated cost \$7,500.

PLUMAS COUNTY—Permit 3830, Application 7082. F. Anderson, R. A. Snyder, Senate Hotel, San Francisco, and A. Mattson, Quincy, December 15, 1931, for 3.00 c.f.s. from South Fork of Poormans Creek, tributary to Poormans Creek, thence Hopkins and Nelson creeks and Middle Fork Feather River, in Section 3, T. 22 N., R. 10 E., M. D. B. and M. Estimated cost \$250.

SAN DIEGO COUNTY—Permit 3831, Application 7021. Karl Feller, Auguanga, December 15, 1931, for 4550 gallons per day from unnamed spring in Section 12, T. 9 S., R. 1 E., S. B. M., for use for irrigation and domestic purposes on 50 acres. Estimated cost \$250. Mining purposes.

LOS ANGELES COUNTY—Permit 3832, Application 7057. Joseph A. Pollia, Los Angeles, December 17, 1931, 135 c.f.s. from an underground spring in Section 1, T. 4 N., R. 11 W., S. B. M., for use for irrigation and domestic on 20 acres. Estimated cost \$750.

Gleaned From the Mail Bag

Cleared Road Permitted Quick Run to Doctor With Injured Boy, Perhaps Saving a Life

From Mr. and Mrs. W. E. Viljoen, Emerald Bay.—Owing to the fine condition of the highway, we were enabled to rush a patient to the doctor in record time. The patient, a boy whose hand was severely cut at the wrist, was in a serious condition. Had we been snowed in, unable to get to medical attention, serious complications would have set in—infection and loss of blood. We wish to thank you for keeping the highway in such good condition and clear of snow. Perhaps a life has been saved.

* * * *

100 PER CENT COURTESY

From C. E. Cooper, Big Bear City.—Please permit me to compliment you on the way you have caused the "Rim o' the World Drive" to be open at this time of the year. Also, I wish to state that the courtesies shown the motorists are absolutely beyond improvement. I get this report from many, many motorists, as I am in a position to meet a great majority of the people that come into Bear Valley. This applies particularly to your Big Bear Mountain Division. Whoever the man is in charge, he should be complimented.

* * * *

RESCUED FROM RIVER

From Gertrude E. Pence, Catalina Island.—I wish to commend the services rendered to us by the highway men in the territory between Crescent City, California, and Grants Pass, Oregon. Our car was wrecked near Camp Idlewyld and your men were very kind in rendering assistance to us, such as salvaging our luggage from the car in the river and aiding me to climb the mountainside.

* * * *

GREAT ACHIEVEMENT

From Senator Bert A. Cassidy, Auburn.—I have just returned from a trip to Truckee over the highway, and want to congratulate you and your men under Mr. Weeks for what I consider accomplishing one of the greatest achievements of modern man in his battle with the elements. The highway is in perfect condition, and it is a truly remarkable feat which your organization has accomplished.

I have spent twenty years in the mountain section of California through which the highway runs, and therefore, I have some knowledge of the conditions under which these men labor.

They certainly deserve the unstinted praise of every loyal Californian who has the interest of his State at heart, and it certainly is a real pleasure to say a word of commendation for yourself and every member of your organization who has made this stupendous achievement possible.

Lassen County Chamber of Commerce Commends Work of Keeping Highway Open

From C. E. Lawson, Secretary, Lassen County Chamber of Commerce.—The directors of Lassen County Chamber of Commerce wish to take this opportunity to extend to you their appreciation for the continuous effort and able manner in which the snow removal crew has handled the situation this winter from Red Bluff to Susanville.

It has been fully demonstrated that the Susanville-Redbluff Highway can be kept open during the winter months. They recommend that heavier and better equipment be installed for another year.

* * * *

ROADS WERE FLOODED

From Archie Stevenot, Merced.—I want to congratulate your department, particularly Ed. Wallace, Division Engineer, on the splendid work of handling traffic and protecting highway all night through Merced both north and south to Yosemite Valley. The water receded around Merced with very little damage.

* * * *

SPLENDID SERVICE

From Henry L. Hinman, Chairman, Good Roads and Highway Committee, Oakland Chamber of Commerce.—The true worth and efficiency of a public service agency is proven under stress and to meet an emergency. We wish to take this opportunity of highly commending the California Highway Commission and your department for the splendid service performed in keeping open for travel the Victory Highway, in the vicinity of Auburn, during the recent storms and heavy snows.

Due to your fine efforts travel to and from Oakland and the East Bay was permitted to flow without interruption over this important artery, and the service certainly justified any expenditure that may have been necessary to keep the highway open.

* * * *

EFFORTS JUSTIFIED

From W. H. Imes, President, Victory Highway Association, Topeka, Kan.—The Victory Highway Association is very appreciative of the fine work of your Department in keeping the Victory Highway open during the recent and all but unprecedented snowfall in the Sierra Nevada Mountains. The travel over that route during the past month has amply justified your efforts.

This fine record can not help but result in encouraging eastern tourist travel to come to northern and central California at all seasons of the year. There has been a hesitancy about this in the past, due to the uncertainty of getting over the mountains during the winter season.

To keep all the gateways to California open the year around is a splendid piece of work.

Col. Skeggs Elected Potentate of Shrine

ANOTHER high honor has come to one of the Highway Division's district engineers. Colonel John H. Skeggs, in charge of District IV with headquarters in San Francisco was recently elected Illustrious Potentate of Islam Temple of the Mystic Shrine.



J. H. SKEGGS

Colonel Skeggs who now holds the chief office over San Francisco's 12,000 Shriners is a graduate engineer, a native of Alabama and a veteran of the World War.

He was born in Decatur, Alabama, and after attending public and preparatory schools entered the sophomore class of Alabama Polytechnic taking a civil engineering course. Graduating in 1901 he came to California and became a resident engineer for the Pacific Electric Railroad. He served as deputy surveyor for Los Angeles County and later as construction and maintenance engineer in the road department. In 1917 he became Senior Highway Engineer of the U. S. Bureau of Public Roads at Albuquerque, in charge of work in Arizona and New Mexico.

The World War found him in France as a Captain of Engineers of the U. S. Army. On his return to this country he became Assistant Division Engineer of District IV in 1919 and was made Division Engineer in 1921, since which time he has been continuously in charge of that district.

PUSHING WORK ON COAST SUPER-HIGHWAY

(Continued from page 13)

as acquiring additional right of way, if required, and in providing funds for curbs and sidewalks, if such improvement is desired, as well as the installation or renewal of sewer, water, or gas lines under municipal jurisdiction; also in many instances in paving additional width of right of way to make a paved full width street.

The cooperative program contemplated by the Division of Highways includes work in the following cities:

Alturas	Vallejo	Sonora
Susanville	Pasadena	Modesto
Crockett	Fullerton	Daly City
Kingsburg	San Bernardino	Fresno
Yuba City	Anaheim	Bakersfield
San Diego	Ventura	

"Official Car" Group Gets a Smile from Orange County Folk

A TRANSPORTATION ensemble that always attracts attention on the roads of Orange County and never fails to evoke a smile from the home town folks is Commissioner Philip A. Stanton, his ancient car, his still more ancient dog and his cigar. The combination, always the same, has been a familiar sight for years.

An unsalaried California Highway Commissioner, of ample means, Mr. Stanton lives



Commissioner Stanton in His "Official Car"

in a fine mansion at Anaheim and the family car is a high-powered, high-priced sedan. Mrs. Stanton drives that and Mr. Stanton shares it, but when Commissioner Stanton goes about his official business, he uses his "own" car, a 1923 remote control model that he calls "the official highway car."

"Foxy," the dog, has been the Commissioner's companion for seventeen years, and requires frequent doses of digitalis to keep him alive. But old age does not weaken his efficiency as self-appointed official custodian of the car. The Commissioner recently left the vehicle by the roadside and walked some distance to inspect a new road alignment. He sent a big motorcycle officer to fetch the car to him. "Foxy" protested with such savage ferocity that the officer was unable to get in the car. A brother officer was called to assist him, but "Foxy" routed them both.

"We'd like to bring up your car, Mr. Commissioner" they told Mr. Stanton, "but the dog won't let us."

As for the cigar unit of the ensemble it is always present and is always a good one.

Coast Highway to Have 100-Foot Width In Congested Area

(Continued from page 16)

of 80 to 100 feet, and Portland cement concrete pavement from 30 to 40 feet wide will be laid. Orange County is cooperating on 0.66 miles of this project with the city of Laguna Beach.

A reinforced concrete bridge 525 feet long has recently been completed on the Roosevelt Highway across Santa Ana River between Newport Beach and Huntington Beach. The width of roadway is 42 feet and there is one 4-foot sidewalk.

A wooden trestle bridge 695 feet long with concrete deck and one removable steel span in the center has recently been completed on the Roosevelt Highway across the north arm of Newport Bay. The width of roadway is 40 feet with two 4-foot sidewalks. Hydraulic fill approaches to this bridge have just been completed.

PROTECTING CHILDREN

SAN DIEGO COUNTY—A small contract for widening and oiling shoulders, a distance of 0.25 mile, has just been completed in Encinitas. This work was done in order to make it safe for school children to go from Encinitas to the grammar school.

A contract for widening the fill across the tidelands between Carlsbad and Oceanside, a distance of 0.3 mile, has just been let. The width of roadway will be increased to 80 feet under this contract.

One of the few lengths of highway remaining to be reconstructed between San Diego and the Imperial County line has just been let to contract. This is the section between Tecate Divide and Mountain Springs Grade, a distance of 14.6 miles. The improvement consists of widening the present 15-foot pavement to a width of 20 feet except on certain portions where grade and alignment changes are necessary to make this highway conform to modern standards. On these latter portions a new 20-foot pavement will be laid.

GRADE SEPARATION

A line change at Jacumba, 1.09 miles in length, including a new bridge across Boundary Creek, and an undergrade railroad crossing, is now in progress. The improvement consists of a graded roadbed 36 to 80 feet wide, with a 20-foot Portland cement concrete pavement, and provides safe alignment across Boundary Creek and the San Diego and Arizona Railway.

Near Del Mar on the Coast Highway a new bridge is being constructed across the San Dieguito River. This is a reinforced concrete deck girder type 596 feet long with a 40-foot roadway and two 4-foot sidewalks. A line change which includes this bridge across the San Dieguito River is now under construction. It is 0.63 mile in length and consists of grading and paving a width of 30 feet with Portland cement concrete.

VENTURA COUNTY—A new bridge across the Santa Clara River near Montalvo is now in process of construction. It is a steel girder concrete deck type 1806 feet long with a 42-foot roadway and 5-foot 10-inch sidewalk.

Between Oxnard and El Rio on the Roosevelt Highway, the construction of an undergrade railroad crossing under the Southern Pacific is in progress.

SECRETARY OF STATE PRAISES AND THANKS

Mr. James I. Herz,
Chief Deputy,
Department of Public Works,
Sacramento, Calif.

My Dear Hr. Herz:

I wish to call your attention to a noteworthy incident which shows that in the employ of your Department you have one that I know of who deserves praise for his accommodating spirit and helpfulness.

Recently while traveling in the storm between Davis and Dixon, a tire "blew" out and our machine was forced from the road into the soft dirt and settled badly. We were in real distress. It seemed impossible to get the tire on and extricate the machine. Just as we were about to go for assistance, one of your employees C. R. Fissell, of 601 47th Street, Sacramento, driving one of the Department's trucks, stopped and came to our aid. In no time at all a new tire was on and he pulled the machine out of the mire and sent us on our way rejoicing.

We appreciated the accommodating, helpful, cheerful way in which he worked and I want you to know it and to thank him. It is such conduct that pleases, and too few of our public employees respond as he did.

Very sincerely yours,
FRANK C. JORDAN,
Secretary of State.

ARCHITECTURAL AWARDS

For Month of December

Chico State Teachers College, Chico—Library and Classroom Building; for general work to H. Mayson, Los Angeles, \$82,379; for complete plumbing and heating work to Woodland Plumbing and Hardware Company, Woodland, \$11,295; for electrical work to James B. Tufts, Chico, \$3,788.

Los Angeles State Building, Los Angeles—Contract for wrecking two buildings on site to Los Angeles Wrecking Company, Los Angeles, \$2,500.

Los Angeles State Building, Los Angeles—Contract for sectional partitions to Pacific Manufacturing Company, Santa Clara, \$27,861.

Division of Parks, McArthur—Caretaker's Cottage, contract to Oliver S. Almlie, San Francisco, \$3,973.

State Narcotic Hospital, Spadra—Superintendent's Residence, Two Ward Buildings and Assistant Physician's Cottage; for general work to Willard Lutz, Los Angeles, \$31,600; for heating work to Walter H. Smith, Long Beach, \$3,095; for plumbing work to Thomas Haverty Company, Los Angeles, \$3,311; for electrical work to H. H. Walker, Inc., Los Angeles, \$1,874.

Veterans' Home, Yountville—Hospital Building; for general work to R. W. Littlefield, Oakland, \$407,245; for electrical work to W. B. Baker and Company, Inc., San Francisco, \$28,495; for plumbing work to Carpenter and Mendenhall, Sacramento, \$36,900; for refrigeration work to Carbondale Machine Company, Los Angeles, \$21,600; for heating and ventilating work to Alta Electric and Mechanical Company, San Francisco, \$34,896.

Divorced are Mr. and Mrs. Howell; he wiped the car with her best guest towel!—*The Pathfinder*.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

COLONEL WALTER E. GARRISON-----Director

JAMES I. HERZ-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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HARRY A. HOPKINS, Taft

TIMOTHY A. REARDON, San Francisco

PHILIP A. STANTON, Anaheim

FRANK A. TETLEY, Riverside

C. H. PURCELL, State Highway Engineer, Sacramento

JOHN W. HOWE, Secretary

HUGH K. McKEVITT, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

G. T. McCOY, Principal Assistant Engineer

L. V. CAMPBELL, Office Engineer

T. E. STANTON, Materials and Research Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District I, Eureka

H. S. COMLY, District II, Redding

CHARLES H. WHITMORE, District III, Sacramento

J. H. SKEGGS, District IV, San Francisco

L. H. GIBSON, District V, San Luis Obispo

E. E. WALLACE, District VI, Fresno

S. V. CORTELYOU, District VII, Los Angeles

E. Q. SULLIVAN, District VIII, San Bernardino

F. G. SOMNER, District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

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J. J. HALEY, Jr., Administrative Assistant

HAROLD CONKLING, Deputy in Charge Water Rights

A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

SPENCER BURROUGHS, Attorney

EVERETT N. BRYAN, Hydraulic Engineer, Water
Rights

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H. M. STAFFORD, Sacramento-San Joaquin Water
Supervisor

GORDON ZANDER, Adjudication, Water Distribution

KATHERINE A. FEENY, Chief Clerk

MABEL PERRYMAN, Secretary

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W. K. DANIELS, Deputy Chief of Division

HEADQUARTERS

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C. H. KROMER, Structural Engineer

CARLETON PIERSON, Specification Writer

C. O. PALM, Chief Clerk

C. E. BERG, Engineer, Estimates and Costs

J. W. DUTTON, General Superintendent Construction

W. H. ROCKINGHAM, Mechanical Engineer

C. A. HENDERLONG, Assistant Mechanical Engineer

W. M. CALLAHAN, Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

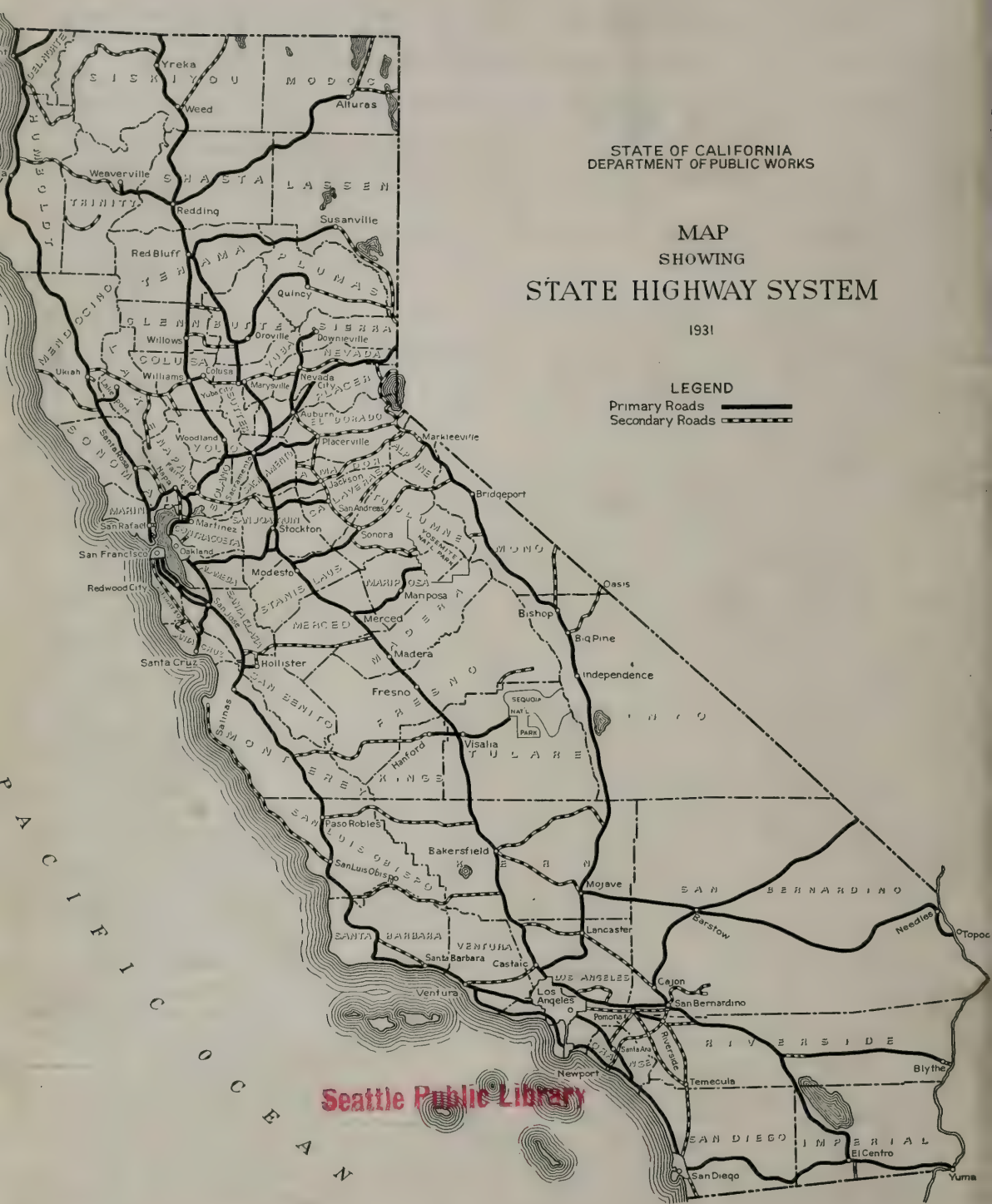
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND
Primary Roads —————
Secondary Roads - - - - -

CALIFORNIA HIGHWAYS and PUBLIC WORKS



New Dormitory Bldg. California School for Deaf, Berkeley

Official Journal of the
DEPARTMENT OF PUBLIC WORKS

FEBRUARY

1932

California's Ten Year Highway Plan Involves Large Savings for State

Orderly Progress in its Development Assures an Economic Success and an Adequate Road System

MORE than two million California motorists have a vital and common interest in the State highway system. Five and three-quarters million citizens are vitally affected, both economically and socially, by the improvement and development of that system. That the State road system may reach the maximum of efficient service it must be developed as a unit, with the needs of the entire State held in mind as its development is planned.

With these fundamental facts before them the California State Legislature, by Senate Concurrent Resolution No. 19, filed with the Secretary of State on March 29, 1929, directed the Department of Public Works to make a study of the State highway system and routes which might properly be added thereto. This investigation involved the consideration of the engineering, economic and traffic problems which would be the determining basis for any plan of development of the State system.

REPORT ACCEPTED

In accordance with the instructions of the Legislature the Division of Highways completed a comprehensive study of the traffic needs of the State in their relation to the State highway system and submitted its findings and recommendations to the legislative session of 1931. The Legislature accepted the report and added to the State highway system the secondary routes recommended for inclusion.

The purpose of this article is to place again before citizens of California a brief resume of the conclusions of this study of the State road system and the method of planning for the development of the network of State highways throughout the ten year period from July 1, 1931, to June 30, 1941.

For the first time in the history of road construction in California a comprehensive plan of unified development has been evolved and estimates of cost made for bringing the State system to a point of adequate service within a definite period.

BASED ON COUNTS

Traffic studies, based upon actual counts of motor vehicles using the different State routes during the past seven years, when projected into the future gave a basis for determining possible future increases in traffic. With proper consideration given to the increase in traffic caused by improvement of highways and contributing factors determined by improvement of parallel and connecting routes, a reliable conception of probable future traffic needs was obtained.

It was upon the results of this traffic survey that the routes added to the State highway system by the 1931 Legislature qualified for their inclusion in the system. These additional routes amounted to a total of 804 miles, 633 miles being added to the southern secondary roads and 171 miles to the northern. These new State routes are largely composed of east and west laterals connecting the north and south arterials.

INCLUDES ALL ROUTES

The ten year program drawn up by the Division of Highways calls for sufficient improvement to the present balanced State highway network to bring that network to a point of adequate service to the motoring public by the end of the ten year period. This ten year study included all routes of the State system and the improvement proposed for the ten year period is based upon the necessary widths, grades and types of surfacing as the traffic studies indicated would be required for adequate service.

This setup for proposed improvement is based upon the most economic development of the system as a whole. With the ultimate and unified system in mind, basic features of highway design and construction have been incorporated in each step of proposed improvement that, with the completion of the last step on any particular unit that unit will present the best features of highway construction which the type of traffic using the unit would require.

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(Continued on page 29)

Russian River Route to Eliminate Mountain Barrier on Redwood Highway

By COL. JNO. H. SKEGGS, District Engineer

THE Redwood area, that picturesque coast section of California lying north of San Francisco and the bay region and extending to the Oregon state boundary, is the only locality in the world where the giant *Sequoia sempervirens* has so colonized and thrived through the centuries that it may be said to constitute an empire. This section has long been noted as a summer vacation land, a sportsman's paradise, and a tourist's delight.

The Russian River section, in Sonoma County, is particularly famous for its many summer resorts, due to its easy access from San Francisco metropolitan area; and not only do people here spend vacation seasons, but each holiday and week-end during the summer sees thousands of the city's tired office workers seeking diversion in a day's boating, swimming or fishing on this river. The Redwood Highway is the traffic artery which transports these vacationists, sportsmen or tourists to or through any section of this vast area.

Cloverdale, on the Redwood Highway, is 80 miles north of San Francisco on the Russian River near the northerly limits of Sonoma County, and may be reached by automobile, including time for ferry transportation across San Francisco Bay, in about two and one-half hours. With the exception of a short stretch in Sausalito, the highway is fast, has easy grades, excellent alignment, is paved all the way, and is marked by the elimination of many railroad grade crossings.

LONG A BARRIER

The 17-mile section of the Redwood Highway between Cloverdale and Hopland, however, has long acted as a barrier for quick, fast trips for all points north of Cloverdale, due to the inferior alignment, heavy grades, and resulting slow travel between these two towns.

It contains some of the poorest alignment and heaviest grades on the entire Redwood Highway. Not only is the road tortuous and dangerous for present speeds and heavy traffic, but in traversing the broken mountain terrain cut by many deep valleys and ravines it crosses seven distinct summits

where dense fogs are oftentimes encountered during the winter months.

This section of highway, both as to standards of location and construction, was well justified when it was first constructed in 1913 to 1915. Not only was it adequate for the trunk line traffic demands of that day, but was made to serve as a connecting route to the McDonald-to-the-Sea State Highway, in which capacity as a tap line for the Anderson Valley and beautiful Navarro River redwoods and State Park the better portion will continue to serve the public for many years to come.

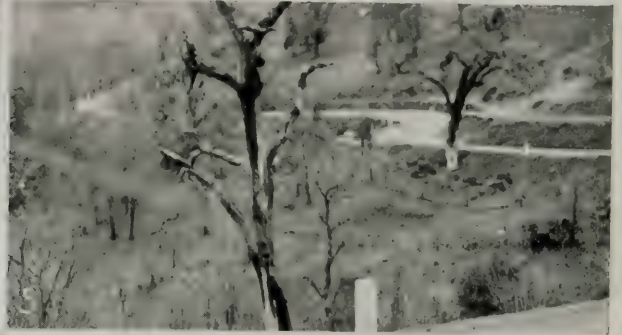
POPULAR IMPROVEMENT

The awarding on February 1st, by Colonel Walter E. Garrison, Director of the Department of Public Works, of the contract for grading a new route up the Russian River from Cloverdale to Hopland, following the approval of the project and allocation of funds by the Highway Commission is not only satisfying a present popular demand, but shows a far-sighted vision of future requirements and developments of this section of our State and its highway. Official groundbreaking ceremonies on February 21st marked the beginning of work on this new section which will open up to the public about 12 miles of scenic river frontage, the only actual Russian River bank location on the entire highway. **The State is purchasing right of way down to and including river frontage wherever possible, for utilization as public park, camping, or picnic ground areas. It should rightfully become one of the most popular week-end destinations for people from Ukiah in the north and San Francisco and intermediate points in the south.**

It traverses a region of restful mountain beauty. Squaw Rock, rising vertically 500 feet above the river and located about half way between Cloverdale and Hopland on the new section, is not only a well-known landmark, which from the north presents a striking likeness of an Indian face, but carries the enchantment of several Indian legends of more or less doubtful origin and authenticity.

In addition to the roadside beauties of the Russian River, the new highway facilitates

(Continued on page 12)



SCENIC BEAUTIES of the Russian River will be made accessible by the Cloverdale - Hopland realignment. No. 1 shows legendary Squaw Rock, a promontory with its squaw face profile towering 500 feet above the stream. No. 2 shows how the line of the highway project runs close to the river bank. No. 3, a view of existing grade curves compared with the revised route as sketched. No. 4 is a scenic bit of the hill country with the new direct routing sketched in on the left and a glimpse of the railroad tunnel portal on the right. No. 5 gives a fair idea of some of the present 276 reverse and "S" curves that will be reduced to 49 long radius curves on much easier grades by the wider, straighter realignment.

Snow Pack and Precipitation Far Above Normal in February Survey

By **HARLOWE M. STAFFORD**, Supervising Hydraulic Engineer

SNOW SURVEYS as a State project were begun in the spring of 1930 when the scattered efforts of many agencies throughout the State were coordinated and standard methods and procedure using standard snow surveying equipment were inaugurated. Some 150 snow "courses," most of them new, were established throughout the Sierra and, through the cooperating agencies, all were surveyed at the end of March which is the time for the principal survey in securing data to be used in forecasting the April-July stream flow. At certain "key" courses numbering close to fifty, the procedure was also established for monthly surveys from January to April to furnish important data on the progress of the snow pack, its manner of accumulation, etc.

The surveys have continued with some extension each season since 1930 but because the greater number of courses were only newly established in 1930 the present season's surveys complete their records for three years only. Except in a few instances, therefore, this has precluded the development of and comparison of the data to "normals" or long-time averages. For present purposes the results of the recent "key" course surveys, conducted in the latter part of January and early February, are compared to those of the corresponding data in 1931.

GREAT WATER CONTENT

In general, the surveys indicate a depth and water content of the snow in early February of this year greatly exceeding the depth and water content of early February, 1931. For the drainage basins from upper Sacramento River to Stanislaus River the water content of this season's snow pack is indicated to be from three to four times that of 1931 (except for the Mt. Shasta snow course, which shows only 1.4 times); in the Merced and Tuolumne basins, from two and one-half to three and one-half times that of last year; in the San Joaquin and Mono basins about four times on an average; in the Kings, Kaweah, and Kern basins from three to five times; and in the Owens Valley drainages anywhere from three to nine times the water content of last year.

Of the courses for which the period of record of the surveys has been of sufficient length to warrant the development of normals, it is interesting to note that three "crest" courses—Blue Lakes on the Mokelumne-Carson divide, Rhinedollar Lake close to the Tuolumne-Mono divide, and Mammoth Pass on the San Joaquin-Owens divide—indicated a snow depth and water content in early February amounting to between 80 and 85 per cent of the normal to be expected for an entire season. (Up to April 1st.) Another crest course, Summit, on the Yuba-Truckee divide indicated a water content equal to 116 per cent of the normal for the entire season.

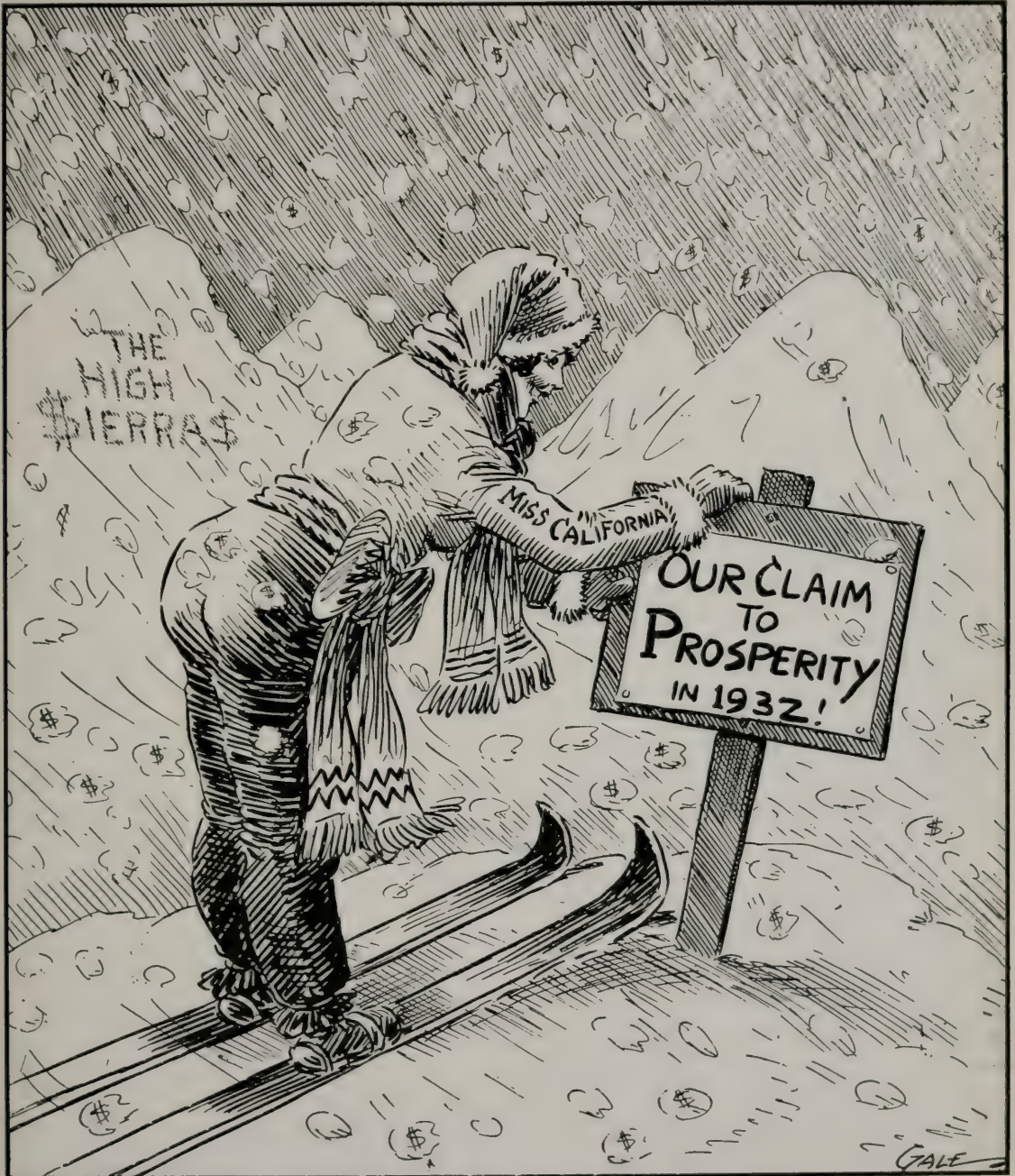
MUCH ABOVE NORMAL

In addition to the data from the snow surveys, a close check is maintained of the records from all precipitation stations in the mountainous and foothill regions of the various stream basins. These are stations of the State, districts, public utilities and the U. S. Weather Bureau but the data are principally for the stations of the latter. In general, these records indicated that the precipitation up to February 1st was between normal and 10 per cent above normal in the upper Sacramento, Pit, McCloud and Feather River basins; from 15 to 25 per cent above normal in the basins from Yuba to Stanislaus; between 40 and 50 per cent above normal from the Tuolumne to Kings basins; from 55 to 65 per cent above in the Kaweah and Kern basins; and from 40 to 60, with a general average of about 50 per cent above normal in the Los Angeles, San Gabriel and Santa Ana basins. Single stations in the Owens and Walker basins indicated a precipitation up to February 1st of 69 and 106 per cent, respectively, above normal, and a general average of 30 per cent above normal was indicated for the Tahoe-Truckee Basin. A general average for the percentage above normal of precipitation to February 1st from the Sacramento to the Kern basins was probably about 35 per cent.

At the Donner Summit on the Yuba-Truckee divide the Southern Pacific Company has maintained a daily observation of

THE WHITE GOLD RUSH!

By GALE in Los Angeles Times



the snow on the ground over a long period of years and this record affords the data for comparisons between this season's snow and that of former years which are most interesting. For a 33-year period it is shown that

the average depth of snow on the ground for February 20th is 92 inches. Actually, on February 20th of this year there was a depth of 132 inches and this depth was only exceeded on February 20th in six prior years.

2300 Miles of Roadsides Being Sprayed and Burned as Fire Hazard

By T. H. DENNIS, Maintenance Engineer

THE Division of Highways Fire Hazard Reduction program for 1932 covers the elimination of roadside weed and grass growth on some 2300 miles of roadsides. It is planned to have the program under way early in March, the work to be divided into twelve contracts and four day-labor jobs.

The location of the work is quite general throughout the State, a 9-foot strip adjacent the right of way line being treated through grazing, grain and brush areas. No spraying is done where the right of way abuts orchard or railroad property.

The treatment consists of applying 27°+ gravity Diesel oil under pressure through orchard type sprays at the rate of 1/35 to 1/10 gallon per square yard of surface treated. Within 24 hours after the application the growth treated turns a yellowish brown color and, at the expiration of a week's time, it can be burned without risk to adjacent property.

EARLY TREATMENT

While this early treatment is not always adequate due to late rains starting a new growth requiring an additional application, it has decided advantages over the late treatment, as the grass is short, permitting a better oil coverage and consequent burning without damage to adjacent fields, and the blackened roadside effect is generally obliterated by the late spring rains. Where recurrent growth occurs, a second light application is usually sufficient, followed by burning which presents little difficulty or hazard.

While Diesel oil is at present the most effective agent for this treatment, it shows no cumulative effect on the roadside growth and the same cost of eradication may be anticipated from year to year.

During the past two years we have been experimenting with a new product which

shows much promise. While its initial cost of application is high, the attendant sterility of the ground following several annual applications makes its final cost less than that of the oil, with the added promise of at least partial release from the annual treatments. An added saving is also possible, as the application does not require burning to eliminate hazard.

IMPROVED EQUIPMENT

The development of the present equipment used in making the application has been the result of much experimenting on the part of the Division of Highways Headquarters Shop Department and Maintenance field forces.

Early treatments were made, using a hand-operated spray bar attached by hose to an oil truck tender. Progress was necessarily slow, depending upon operator.

The present equipment consists of a trailer equipped with engine and turn-table mounting a trussed arm, supporting a series of spray bars. The arm can be quickly moved laterally or horizontally by the operator as occasion demands. The spray bar attached to this arm is usually separated into three 3-foot sections with sprays 12 inches apart. These spray bars can also be

moved horizontally or vertically from the operator's platform to conform with the various slopes encountered, or to avoid unnecessarily spraying trees or shrubs.

13,000 GALLONS A DAY

The trailer has a mobile hook-up with the truck tender and pumps the oil directly from the truck through the spray bars under a 30-pound pressure. When the tender is empty, the trailer is released and attached to another tender. Some 13,000 gallons of oil has been pumped through these sprays with this outfit in an 8-hour day.



T. H. DENNIS



ROADSIDES AFLAME with the roaring red demon leaping and crackling along the hedges is a fearsome sight under ordinary conditions but when you see Highway Maintenance outfits in the vicinity you know everything is safe and under control—just Spring housecleaning.



THE TANK CORPS with numerous units equipped like the above is engaged in the annual preliminary skirmish against old Demon Fire Hazard on all State highways. A weed spraying outrigger on an oil spreading trailer makes combustion sure and complete with a liberal dosage of inflammable mixture.



FIRE ZONE ahead is warning conveyed by Highway car carrying a large sign.



INDIAN TEPEE style of cover protects roadside trees from the spray and possible scorching.

Work Completed and Under Way in Four Counties Along Coast

By L. H. GIBSON, District Engineer

WORK has just been completed on 9.8 miles of the Coast Highway between Atascadero and one and one-half miles south of Santa Margarita in San Luis Obispo County. The roadbed is thirty-six feet wide with a twenty-foot asphaltic concrete pavement.

On the Coast Highway between Arroyo Grande and Los Berros Creek, the road is being reconstructed with a thirty-six foot roadbed and a twenty-foot reinforced Portland cement concrete pavement. Within the limits of this project new bridges are under construction across Arroyo Grande Creek and Los Berros Creek under the supervision of the Bridge Department.

Construction is in progress on Maintenance Buildings, including a foreman's residence at Cambria.

Surveys and plans are complete for the reconstruction of the Roosevelt Highway between Cambria and San Simeon.

ELIMINATES GRADE

San Benito County—On the Coast Highway from Monterey County line to the San Benito River, 5.5 miles in length, a new road is being constructed via the Pincate Rocks. The roadbed is thirty-six feet wide, with a twenty-foot Portland cement concrete pavement. This project, with a portion of the road in Monterey County, 11.1 miles in length, just completed, will eliminate the old San Juan Grade from the main Coast Highway. Winter rains have delayed the work.

Monterey County—Grading and paving the approaches, 0.5 mile in length, to the new steel and reinforced concrete bridge across the Salinas River at Bradley is progressing. The roadbed is thirty-six feet wide with a twenty-foot Portland cement concrete pavement.

On the Roosevelt Highway—along the Coast south of Carmel between Rocky Creek and the San Remo Divide, the old road taken over by the State from Monterey County, will be replaced by a new roadway, now under construction. The roadbed is twenty-four and thirty feet wide with a selected material surface twenty feet wide by eight inches thick.

THREE BRIDGES

On the Roosevelt Highway, south of Carmel, three reinforced concrete arch bridges have just been completed or are under construction at Garrapata Creek, at Granite Creek and at Bixby Creek. All of these bridges are under the supervision of the Bridge Department.

Construction is in progress on buildings, including a residence for the Maintenance Superintendent, at Salinas.

Santa Barbara County—A major change of line is under construction on the Coast Highway between Los Alamos and one and one-half miles south of Santa Maria on a route through Solomon Canyon. The roadbed is thirty-six feet wide, with a twenty-foot reinforced Portland cement concrete pavement. The portion from Los Alamos to two miles north of Solomon Summit is 9.7 miles in length, and the portion from two miles north of Solomon Summit to one and one-half miles south of Santa Maria is six miles in length. Work on both projects is well under way.

New Type of Paving Machine Exhibited at Road Builders' Show

By R. H. STALNAKER, Equipment Engineer

THE 1932 Convention and Road Show of the American Road Builders' Association was held at Detroit on January 11 to 15. The trend toward omission of the heavier classes of construction equipment, which was evident last year at St. Louis, was still more pronounced this year and nearly all classes of heavy equipment were conspicuous by their absence; however, the displays of motor trucks and accessories were better than at any previous show and there was considerable interest in the exhibits covering materials and methods for low cost roads.

At the convention meetings and committee meetings several very interesting papers were presented. As they will all be available in the proceedings a little later, it is hardly worth while to attempt to recapitulate any of them here.

ELABORATE EXHIBIT

Several of the State Highway Departments had important exhibits and the exhibit of the Bureau of Public Roads was particularly elaborate and instructive.

One very promising machine for mixing and laying the so-called roadmix low cost pavement was shown by means of motion pictures. Several small power shovels were shown but none of the larger ones.

A rather interesting new development was a sweeper adapted for attachment to the front end of a light truck, which may be secured either with or without a water tank. This outfit seems to have considerable possibility in connection with the preparation of our roads for oiling. Some new and highly portable car heating units and units for heating bituminous material were displayed.

NOTABLE INNOVATIONS

Only two pull-type graders were shown, both radically different from the conventional type of grader. These machines attracted considerable attention. One new type of dual drive 1-man tractor grader was on exhibit. Several new models of trucks were exhibited and some showed notable innovations.

The exhibit of the New Jersey State Highway Department stressed the various types of grade separations of Highway intersections which are being constructed so freely in that State and some very interesting pictures and plans of these intersections were on exhibit. Our neighbor State, Nevada, had a splendid collection of photographs showing scenery and highways in various parts of the State as well as a supply of literature and maps for distribution.

Detroit being the center of the automobile industry of this country, many of the delegates availed themselves of the opportunity to visit truck and automobile plants in Detroit and vicinity. A particularly interesting trip was that to the General Motors' proving ground near Pontiac, Michigan, where all the tests of cars made by the General Motors Company are conducted.

Father: "What did you and Joe talk about last night?"

Daughter: "Oh, we talked about our kith and kin."
Small Brother: "Yeth, pop, I heard 'em. He seth, 'Kin I hev a kith?' and she seth, 'Yeth, you kin'."
—Exchange.

Winter Traffic Count Reveals Increase on Snow Area Highways

THE PRIMARY purpose of the Highway Division of the Department of Public Works is to serve traffic. In order to carry on the work intelligently it is essential that periodical checks be made of the flow of traffic. Detail information is necessary as a basis for allocation of funds for the preservation of the investment which has already been made and is even more necessary in planning for improvements and extension of the highway system.

The first extensive traffic survey in California was started in 1920. This survey was financed jointly by the State, several counties, and the United States Bureau of Public Roads. The latter organization conducted the survey which was not completed until 1922. The work covered all important phases of the traffic problem as presented at that time. The report of that survey has been of real value and is still used as a reference base for traffic studies. In 1924 a system of traffic stations covering all State highways was laid out, and since that time two regular counts have been made each year.

MAXIMUM AND MINIMUM

The Sunday and Monday nearest the middle of the months of January and July are taken as the dates for these semi-annual counts. These periods were selected as giving the minimum and maximum traffic period for the year. The last count was taken January 10 and 11. Owing to adverse weather conditions it reflected a small decrease in traffic on main North and South routes with an increase on mountain routes leading to snow sport areas. In addition to and during the week of the two-day counts, a seven-day count is conducted at ten stations. These latter stations are selected with a view to securing information as to representative conditions of daily variation for the particular locality.

All counts cover a sixteen-hour period from 6 a.m. to 10 p.m. each day. Sufficient 24-hour counts have been taken to fix the relation of the 16-hour traffic to that of a full day. For practical purposes, the 16-hour traffic is 92 per cent of the total 24-hour count.

The count is segregated by hours and also by type of vehicles—that is, a separate record is made of California automobiles, out-of-state automobiles, buses, light trucks, heavy trucks, and trailers behind

trucks. A column is also provided for horse-drawn vehicles, but the latter class of traffic is practically extinct on the State Highways.

Only the totals of the counts are assembled and printed. Several hundred copies are sent out to commercial organizations, chambers of commerce, tourist bureaus, and other organizations which require the information in connection with their plans for development and other business purposes.

ESTIMATES FOR 1940

A great deal of time has been spent in assembling and analyzing the counts and putting the results in shape to apply to the highway problems. In order to have a basis of comparison on which to determine the width of improvement required for a given section of road, the hourly capacity for two, three, and four lane pavements have been worked out.

A prediction has also been made as to what traffic may be expected in 1940 at all traffic stations on the system.

The variation of traffic day by day and month by month during the year has been considered, all with the purpose of making the semiannual counts readily available to every department in the organization.

SPECIAL CREW ASSIGNED

In addition to the semi-annual counts, special counts are in progress at frequent intervals. The last session of the Legislature, by resolution, required that the study of

roads considered as additions to the highway system be continued. A special crew has been assigned to this work and at least four counts will be made at some eighty points throughout the year by the district maintenance organizations.

Counts are also made at road intersections when a question of signal installation arises and at points where some special hazard or demand for additional facilities or services is under consideration.

The field organization of the Maintenance Department is assigned the task of taking the counts. The final assembling and analysis is handled under the direction of T. H. Dennis, maintenance engineer.

TRAFFIC CENSUS RESULTS PUBLISHED AS ADDENDUM

The annual winter traffic count is being published with this issue of California Highways and Public Works as an addendum supplement. Taken on January 10 and 11, this count records figures for the minimum traffic period of the year when inclement weather usually prevails. Such adverse conditions this year are reflected in a slight decrease over January, 1931, figures on main North and South routes with a marked increase on recreational routes throughout the State indicating the growing popularity of winter sports made accessible by cleared highways. In the desert regions of the South high winds were prevalent on the days of the count.

Canada has a system of improved roads embracing over 75,000 miles.

State Achieved New Records in High Class Paving Construction during 1931

Greater economy and efficiency in the construction of high class pavements accompanied by greater speed in production were achieved for the State of California in 1931 by the Department of Public Works. Through the initiative and efforts of State Highway engineers, new methods and improved equipment were suggested and developed resulting in higher yardage records, better mixes and smoother surfaces. How these were obtained are told in the following article:

By **EARL WITHYCOMBE**, Assistant Construction Engineer

THE CONSTRUCTION of higher class pavements by the State of California during 1931 has been marked by greater efficiency in the type of equipment employed, as well as by a better knowledge of the use of the materials going into the work. Modern construction methods and machinery, applied by first-class contracting organizations and supervised by experienced engineers, have resulted in economical highway operations and increased output, with no sacrifice of quality of work done.

During the year 1931, one mixer used on a portland cement concrete paving project averaged 467 cubic yards of concrete per eight-hour day for 45 days, operating at 99 per cent efficiency. Two mixers working side by side averaged 853 cubic yards per eight-hour day for 22 days, operating at 92 per cent efficiency.

A new type of chair for supporting steel reinforcing bars has been developed, with the driving unit independent of the steel support. This has met with immediate approval since they are less difficult to drive and there is very little loss of material due to setting. When a pin is bent in driving it can either be straightened or replaced with a new pin without the necessity of replacing the chair.

JOINT CONSTRUCTION

In placing concrete pavements, difficulty was experienced in keeping the concrete from running around the ends of the joint material, and in order to insure a clean-cut joint throughout the entire width of slab, an end socket of sheet metal was devised which virtually serves as an extension to the joint material.

Considerable difficulty has always been experienced with the finishing machine pushing over the joint material. To overcome this, a cast iron frog was so devised as to clamp

on the side forms and lift the machine across the joint.

In order to keep the top edge of the joint material true to line during finishing operations and after the removal of the backing plate, a steel channel section was adopted to slip over the joint material and extend 1½ inch down into the slab.

REDUCING ROUGHNESS

Edging of joints unquestionably adds roughness to the riding qualities of a pavement. To reduce this roughness as much as possible, a dummy joint is being designed that does not require edging. This joint is formed with a steel plate, and after the heavy floating is completed the plate is removed and replaced with a strip of 16-gauge sheet metal, having a suitable anchor on the lower edge. Care is exercised to keep the upper edge of this strip as near the surface of the slab as practicable.

Subsequent floating over the joint removes all surface indication of its existence and after a few hours a distinct crack appears which is uniform in all respects. The problem of skewing all transverse joints to reduce the sharp impact of the 90° joint is being given some consideration at the present time.

California practice in finishing has been slightly altered during the past season. The heavy longitudinal or bull float follows behind the machine finisher, and following this all subsequent floating is being done with a one-man ribbed float 8 to 10 feet long, operated from the side by means of a long handle. Usually three of these floats are employed at the different stages of concrete set, the final floating being just as the last free moisture leaves the surface. **With this method of delayed finish, there has never appeared the slightest indication of scaling and the roughness of texture obtained is high'y desirable.**

(Continued on page 37)



FAST WORK in finishing this new portland cement concrete paving job in Placer County was made possible by several devices created by State Highway engineers.



LIKE A CARPET this big gang laid a broad strip of asphalt concrete pavement in San Luis Obispo County in record time by employing more efficient methods developed by State experts.



NO WRINKLES or rough places are to be found in this fine forty-foot asphalt concrete pavement laid in Santa Clara County under superior mix formulas and finishing methods developed in the Public Works laboratory.



NEW CHAIRS for supporting steel reinforcing bars in expansion joint construction were developed for this paving job in San Joaquin County. The metal chairs are shown supporting the bars.

New Route Reduces 276 Curves to 49

(Continued from page 2)

connections to a scenic, though at present unimproved, county highway up Sulphur Creek to the famous Steam Geysers, a most fascinating and unusual trip through a section of many surprising phenomena of Nature.

From the more practical viewpoint of pure highway traffic considerations, the advantages of the new route can best be shown by comparison with similar features of the existing highway between Cloverdale and Hopland, a few of which are herewith enumerated:

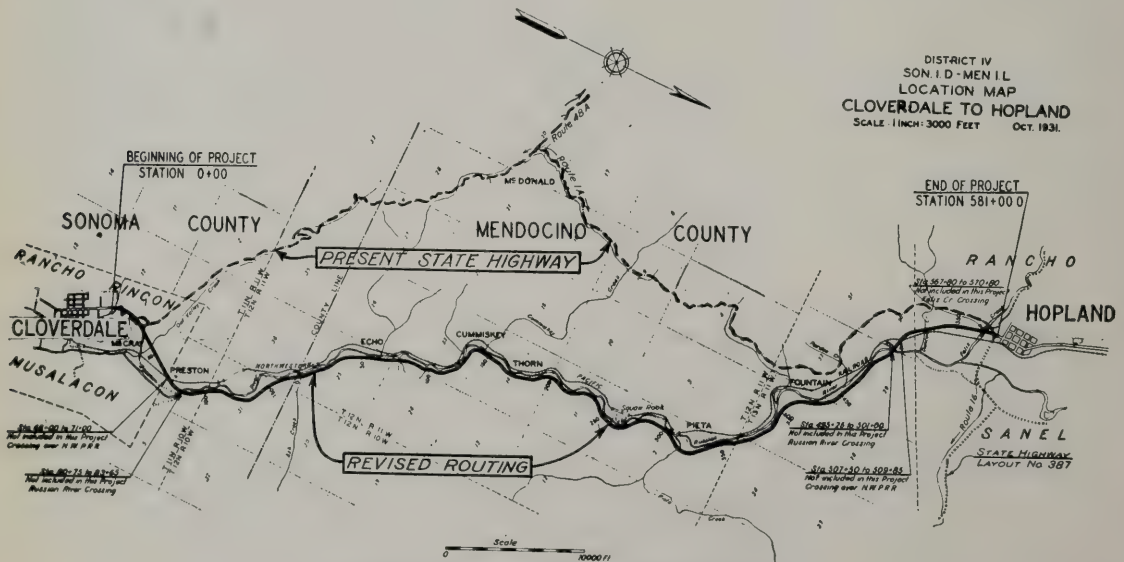
- 1—It saves three miles in distance over the existing route.
- 2—Whereas the present road has 276 curves, 229 of which are of 300-foot radius or less, 99 being 100-foot or less; the new road has only 49 curves, with a minimum radius of 1000 feet.
- 3—The old road has five miles of 7 per cent grade and three and one-half miles of 6 per cent grade, with 3760 feet of rise and fall; whereas the new route has less than three-eighths of a mile of 6 per cent grade, with 1000 feet rise and fall.
- 4—The new route will probably be below the more frequent high mountain fogs and occasional snows encountered on the present road summits.
- 5—The average driving time between Cloverdale and Hopland will be cut in two, with the advantage being greatly accentuated for bad weather conditions.
- 6—Travel on the entire highway should be greatly increased, due to basic safety design and to

the stimulating influence of bringing all points between San Francisco and Cloverdale fifteen to twenty minutes closer to the main domain or body of the area to the north.

OPERATIONS BEGUN

The present contract, under the supervision of District IV, Division of Highways, calls for grading only, clearing operations preparatory to the grading work being well under way. Exceptions have been made in the contract for six major structures which will be contracted under the supervision of the Bridge Department, Division of Highways; two overhead grade separation structures at the Northwestern Pacific Railway crossings at Preston and near Hopland; two bridges across the Russian River at the same general location; one bridge to gap a troublesome slide area opposite Squaw Rock; and a bridge over Feliz Creek.

The grading contract presents many engineering problems in river protection work, and construction through what has long been considered one of the most potentially active slide sections of this country. Unfortunately for the highway, the Northwestern Pacific Railroad occupies the westerly bank of this section of the Russian River, which is much freer from slide formations than the easterly bank, but is also much more precipitous and involves several tunnels and other disadvan-



Map of Cloverdale-Hopland Realignment

Opens Scenic River Areas to Public

(Continued from preceding page)

tages. This railroad location on the steep west bank forestalls any possibility of also constructing a highway on the same side even though the bridge structures could be dispensed with.

SLIDE PROBLEMS

The geological formation of the east bank is volcanic, being a lava flow superimposed over the bed rock formation, and in the slide sections in the nature of a porous tuff which becomes cohesive and subject to slippage action when saturated with water, but free from such action when well drained. The principal slide areas show impounding reservoirs above, which allow the water to saturate and seep into the volcanic tuff. The principal engineering feature thus becomes one of drainage toward destroying these impounding areas, or of draining and drying the slopes below the impounding reservoir in the vicinity of the highway. As previously stated, the worst slide area is opposite Squaw Rock, where it is proposed to construct a bridge anchored into the base rock foundation and, if necessary, sluicing the slide down into the river. A fill across this portion would probably be extremely unstable.

The river protection work consists in con-

structing rock retaining walls, utilizing the many large boulders along the river. Rocks are to be placed by derrick to neat lines and grades upon excavated foundation and face of wall is to be laid on 1 to 1 slope and grouted where necessary.

MANY SAFETY FEATURES

The contract price is approximately \$465,000 and allows 400 working days for completion of the grading and minor bridges and structures, which means that work should be completed in the summer of 1933. M. C. Fosgate, resident engineer, on completion of this project can proudly point to some 65 miles of the Redwood Highway of which he has been in direct charge of both grading and paving contracts.

This trunk line highway will be graded to a minimum width of 37 feet, combining therewith such features as railroad grade separations and bridges adequately designed to meet traffic demands for years to come, with all possible safety features being included in the basic engineering design. These provisions, so essential for the accommodation of present and future demands, will when complete stand out as an example of the greatest possible benefit to be obtained through a reasonable expenditure of gas tax funds.

Federal Road Task Still Large--Must Maintain Fast Gait

Although Federal contributions for road building compose only a small part of the money annually spent on roads, the value received makes Federal participation one of the country's best bargains.

This statement was made by Frederic E. Everett, President of the American Association of State Highway Officials, in calling attention to the current road building task.

"The road job ahead is still large. The latest figures available show that at the end of 1930, 30 per cent of the roads in the state highway systems was unsurfaced, 44 per cent covered with low type surfaces and only 26 per cent surfaced with high type pavement.

"On the 197,000-mile Federal Aid system which, remember, is included in the state highway systems, July 1, 1931, 39 per cent of the roads had high type pavements and 40 per cent had intermediate and low

type surfaces. Fourteen per cent were graded and drained and seven per cent were unimproved.

"Progress to date on the Federal Aid system has been excellent. The report of Thomas H. MacDonald, Chief, Bureau of Public Roads, for the fiscal year ending June 30, 1931, shows that there were 11,033 miles completed last year as against 8,682 miles the previous year. But there is still much to do. Thousands of miles of surfaces classed as intermediate types should be lifted to high type. Thousands of miles of graded and drained roads and of low type roads should be hard surfaced. Road usage is still ahead of road supply. The lowered road maintenance costs and car operating costs that go with better roads make it imperative that both the states and the Federal government sustain their road building efforts," concluded Mr. Everett.

Approximately five per cent of pedestrians killed by automobiles in 1930 lost their lives while crossing intersections against a traffic signal.

The girl friend collects antiques, and recently she acquired a horsehair chair, whereupon she discovered immediately why grandmother always wore six petticoats.—*National Motorist*.

State Highway Links Being Built Through Cities on a Cooperative Plan

TWO hundred and two California cities are connected by the State highway system. In many instances the cities are located on through routes and a large proportion of the traffic is not of a local nature. The city streets over which the State highway routes pass are important links in the system and, as such, the condition of their improvement is a vital factor to the road network as a whole. The length of these links lying within the corporate limits of municipalities aggregates 457 miles, which is about 6 per cent of the total mileage of State highways.

As the function of the State highways is to provide adequate and ample intrastate traffic facilities, the Division of Highways recognizes the responsibility of the State for a share in the improvement of the highway links lying within cities. The municipalities are responsible for the share of improvement which could be charged to local traffic.

Upon the basis of this dual responsibility of State and municipality a policy for cooperative participation in improvement has been inaugurated. Many miles of State highway routing within incorporated cities already have been improved by State cooperation with local authorities and many more such projects are already under agreement or anticipated for the near future.

A MUTUAL BENEFIT

By cooperative methods, continuity in the State system is obtained and travel facilitated and at the same time the local community benefits from a higher standard of improvement than the abutting property could afford.

The basis of cooperation is an individual problem for each project and the equitable distribution of costs is determined by conference with the local authorities. The customary basis of cooperation between the State and municipality consists of the State grading, draining and paving to the same standard of construction as obtains on the State highway connecting the cooperative project, and the local community providing for the remainder of paving and grading, placing curbs and

sidewalks and providing the necessary right of way.

While the Division of Highways welcomes proposals from local authorities, and such applications are in excess of the funds available at present, cooperative funds are limited and prior consideration is given to those cities which show the greatest cooperation in advancing their portion of the obligation.

PROJECTS DESCRIBED

During the current biennium funds amounting to \$2,750,000 have been provided for the State's share of cooperative projects and work completed or now under way totals more than one million dollars for the State's share of this cooperative work.

The following brief descriptions of a few of these cooperative projects in which the State has participated or which are anticipated for the near future provide a picture of this phase of highway activities in California.

In Yuba City, Sutter County, the connecting link of the East Side Highway passes along Plumas Street. In cooperation with the authorities of Yuba City the State will widen the existing pavement ten feet on the westerly side of the street, place the curb and sidewalk and move encroaching buildings within the two blocks from Teagarden Avenue to Sumner Street. The city will furnish the additional ten feet of right of way necessary and construct similar widening on the easterly side of the street. The city will also provide a 100-foot right of way from Sumner Street to the city limits and the State will place a 30-foot pavement over this portion of the route.

DALY CITY AND COLMA

One of the larger cooperative projects which it is planned to start this year will be the widening of Mission Street between Daly City and Colma where the Coast Route enters San Francisco. The existing 66-foot right of way is to be widened to 88 feet and 108 feet and the pavement widened accordingly.

The entire cost of this important improvement to this heavily traveled arterial is estimated to be approximately three-quarters of a million dollars. The State will contribute



BEFORE cooperation came to Lodi in highway building in which State and city share the expense, this is how the State highway looked at the point where this main arterial known as Stockton Boulevard crosses the railroad tracks entering the city from the south.



AFTER the cooperative improvement was finished, this view, taken in September, 1931, at the same point, looking south from the north end of the project, shows the broad new concrete pavement, 76 feet wide over which traffic flows through the city without congestion.

\$200,000 to the securing of rights of way and also pay for the cost of a 40 foot pavement width, the remaining costs of right of way and the cost of the balance of the paving will be borne by the city and county of San Francisco, San Mateo County and Daly City.

Where the heavily traveled Coast Route between San Francisco and Los Angeles passes through the city of Santa Clara, at the southerly end of the San Francisco peninsula, traffic has been greatly impeded by the constricted routing along Franklin street. This

(Continued on page 20)

State Pays \$10,000 Daily in Wages to 4400 Road Workers in Relief Quotas

FORTY-FOUR hundred wage earners are now engaged in the extra employment launched by Governor Rolph last October.

On the three-day schedule, 2200 are on the job six days of the week. The pay roll, at the rate of \$4 per day, is \$8,800. To this number should be added the extra men required in transportation and supervision, bringing the daily expenditure up to \$10,000.

The scenes of the work are scattered over the State from the Oregon to the Mexican line. Nearly two hundred communities are sharing directly in the disbursement of the money. Their proximity to highways in need of extra maintenance work has brought them into the picture, not their population or some condition of unemployment differing from other communities.

NECESSARY WORK

As has been pointed out, none of the work has been created for the emergency. It represents kinds of work which under any circumstance and at any time would have to be done "by hand." The localities were selected by the engineers, and the \$1,600,000 to pay for it was provided for by an allocation of the Highway Commission. The work is under the supervision of the maintenance section of the Highway Division; but its general oversight has received the personal attention of the Director of Public Works.

The available funds were not sufficient to spread the work into every community; but each one benefits either by providing a quota

of men or through the lessening of the general strain of unemployment. The relief work will be continued until the fund is exhausted, and it is now believed that the appropriation will carry on until the latter part of April.

As a rule, the men have given value received for the money. It is quite true that laggards get into some of the crews. It is equally true that much of the work, though necessary, seems slow in a machine age. But taken as a whole, the foremen report good results.

HITTING THE BALL FOR EIGHT HOURS PER DAY

The Sonora lateral of the State Highway system is undergoing considerable improvement under the impetus of the "unemployed" crews recently put to work.

All along the highway below Sonora and running down past Yosemite Junction the turns have been widened and daylighted, the bends filled.

New pavement will be placed on the new roadway in the spring when the fills have been packed.

Those who have had a picture of the State acting as a Santa Claus to the unemployed will lose sight of the fallacy if they see these men hitting the ball for their eight hour shift. The State is getting dollar for dollar in their program of caring for the "unemployed."

—Sonora Banner.

FAMILY MEN FIRST

Every effort has been made to give the jobs to married men or those with whole dependents. The publicity given the employment and its nature, has brought in thousands of applications which could not be favorably met. In many instances, these applications have come from communities and individuals in sections where there was no immediate call for extra maintenance work. The experience of Mayors, Legion Commanders, and other officials charged with propos-

ing the personnel has opened to view the unemployment situation in its most distressing form and to its widest ramifications.

More than 7500 notification cards have been mailed in mobilizing 4400 men. Checking the situation as a whole, fully 20 per cent of the men called to work failed to respond.

It is not improbable that many of them, despairing of securing work in their resident community, have begun searching over the State in the hope of succeeding elsewhere.

Fine American Spirit Shown by Men Given Work on Highways

(Continued from preceding page)

The cards mailed to their last registered address evidently did not reach them.

FEW REFUSE JOB

There has been a very small percentage of direct declinations of the jobs offered. Another small percentage has been in the physical inability of some men to do manual labor. There have been some resignations to take other employment. A negligible number have flatly refused three-days-a-week labor.

A pleasant revelation has been the fine, old American spirit of independence and energy. It is doubtful whether more than 60 per cent of the men now doing manual work on the highways were ever before on the business end of the pick and shovel. Many semiprofessional, many clerical men and skilled mechanics have taken this work rather than remain idle. Instances of splendid sportsmanship have come to notice. The jade of misfortune has not broken the spirit of these men. With hearty good will, they have taken their places in the democracy of necessity.

"However," says a close observer, "a study of the subconscious attitude of the idle and unemployed must prove of value to students of social conditions. Striking contradictions appear. Some of the most cheerful types do not themselves appear to recognize their deeper mental reactions.

AN AVERAGE COMPLEX

The resentment of the average man against unemployment and his personal plight is usually revealed only in a friendly conversation. Outwardly, he may seem to feel that he is bucking 'hard luck' that is inevitable in life."

Nevertheless, the State continues an employer of the first magnitude through the direct and contracted activities of the Divisions of Highways and Architecture.

"And this is your bump of curiosity?"

"Right, Professor. I got that by sticking my head in the elevator shaft to see if the elevator was going up. It was coming down."

"Do you want gas?" asked the dentist as he placed the patient in the chair.

"Yes," said the absent-minded professor, "About five gallons—and take a look at the oil."

THE MEN ON THE ROAD

When the day is clear and your car's in gear,
And your foot's pressed down on the gas,
Where the road is straight and the going
great,

Do you notice the Men you pass?

The Men who toil with the earth and oil,
And shovels and picks and brawn,
Though the day be drear and the skies not
clear,
You'll find them carrying on.

You'll find these Men where the storms have
been,
With their shovels and picks in their hands,
Or late at night by a Danger light,
Where a shivering watchman stands.

When you cross the place where the lizards
chase,
Their shadows across the sand,
And the breeze that blows is never froze,
Out in the Desert land.

Or high in the hills where the cuts and fills,
Are covered by winter snow,
You'll find the crew at the work they do,
Wherever the Highways go.

SO RAISE YOUR HAND as you pass where
they stand,
Where they've paved the way for your load,
These Men who smile as they work the while,
The Men who work on the road.

Joseph Holt,
Highway Maintenance Sub-foreman,
District VIII.

California Gains

California is one of the few States in the Union that will show an increase in motor vehicle registrations for 1931, it is believed by the Automobile Club of Southern California from preliminary reports being received. While the gain in the State is small, only .38 of one per cent, or 7982 vehicles, it is regarded as indicating that California has been less affected by the general depression than any other State in the Union.

"Mud Road Tax"

Only 4 per cent of the country roads in the United States have been hard-surfaced. There are 2,500,000 miles of highways that are still mud roads and subject to the "mud road tax" paid by the motor vehicle owners in the form of higher operating costs, increased depreciation, and greater upkeep expense. "We pay for our roads whether we have them or not" is held to be axiomatic by careful students of highway economics.—*American Road Builder*.

Justice: "How did the accident happen?"

Stremic: "Why, I dimmed my lights and was hugging a curve."

Justice: "Yeah, that's how most accidents happen."
—*Case and Comment*.

Tunnel Under Town Abolishes Traffic Bottleneck and Bad Grade Crossing

Elimination of a traffic bottleneck on a transcontinental highway and a grade crossing over multiple railroad tracks is the dual accomplishment by engineers of the Department of Public Works at Newcastle on the Victory Highway. The improvement will be ready for official opening ceremonies in May. Some interesting engineering features of the project are detailed in the following article.

By **JAMES W. TRASK**, Resident Engineer

THE actual construction of the Newcastle Tunnel and approaches was completed December 21, 1931. The paving was a separate contract and is now being done so that the tunnel will probably be open for traffic by the middle of May.

Newcastle is located between Roseville and Auburn on State Route 17 and Government Route 40, and aside from its local importance that route is a portion of one of the main transcontinental highways.

The new construction eliminates the present highway through the town which has very bad alignment with excessive grades. It will also better the traffic situation, which becomes very congested during the fruit shipping season.

SIDEWALKS PROVIDED

The roadway of the new section is normally 46 feet in width with a 30 foot paved width through the approach cuts and tunnel, and a three-foot sidewalk on either side. The center line clearance of the tunnel is 20 feet 9 inches throughout its 530 feet length, and the structure is on a 2 per cent grade which provides ample drainage. Reinforced concrete lining was used throughout.

Method of Tunneling—Three 7 x 8 pilot tunnels were driven, one at top center and one on each side at bottom right and left. After completion of the pilots, cribbing was placed on each side of the lower drifts with 3 x 8 timbers placed crosswise at roof. Space for muck cars was left between cribs. Material from stope was then shot down, trapped into mine cars, and hauled to spoil pile. The core was excavated by a gas shovel after lining was complete and material hauled by truck to placement.

Formation Encountered—Beginning at west portal, Sta. 154+69, a rotten, partially

decomposed granite filled with mud seams was encountered to Sta. 156+09; from this point to Sta. 159+80 was hard granite although quite seamy. The last 20 feet (to Sta. 160+00, east portal) was similar to that first encountered.

Timbering—Approximately 140 lineal feet of timbering was required in the top and 90 feet in each of the two lower pilots. Timbering was composed of 8 x 8 framed sets at approximately 4 foot centers. 3 x 8 lagging was used and packing was of random sizes and lengths. Stope timbering was of 8 x 8 posts at 4-foot centers with 8 x 8 longitudinal caps, lagging and packing same as for pilots.

Forms—Forms were constructed in panels 10 feet long and eleven panels were required to complete the ring. 1 x 4 T. and G. sheathing was used on 2 x 8 joist at 20-inch centers. The joist were cut to conform to the radius. 6 x 8 longitudinal caps were placed at panel connections, the caps resting on 6 x 6 posts at 5-foot centers.

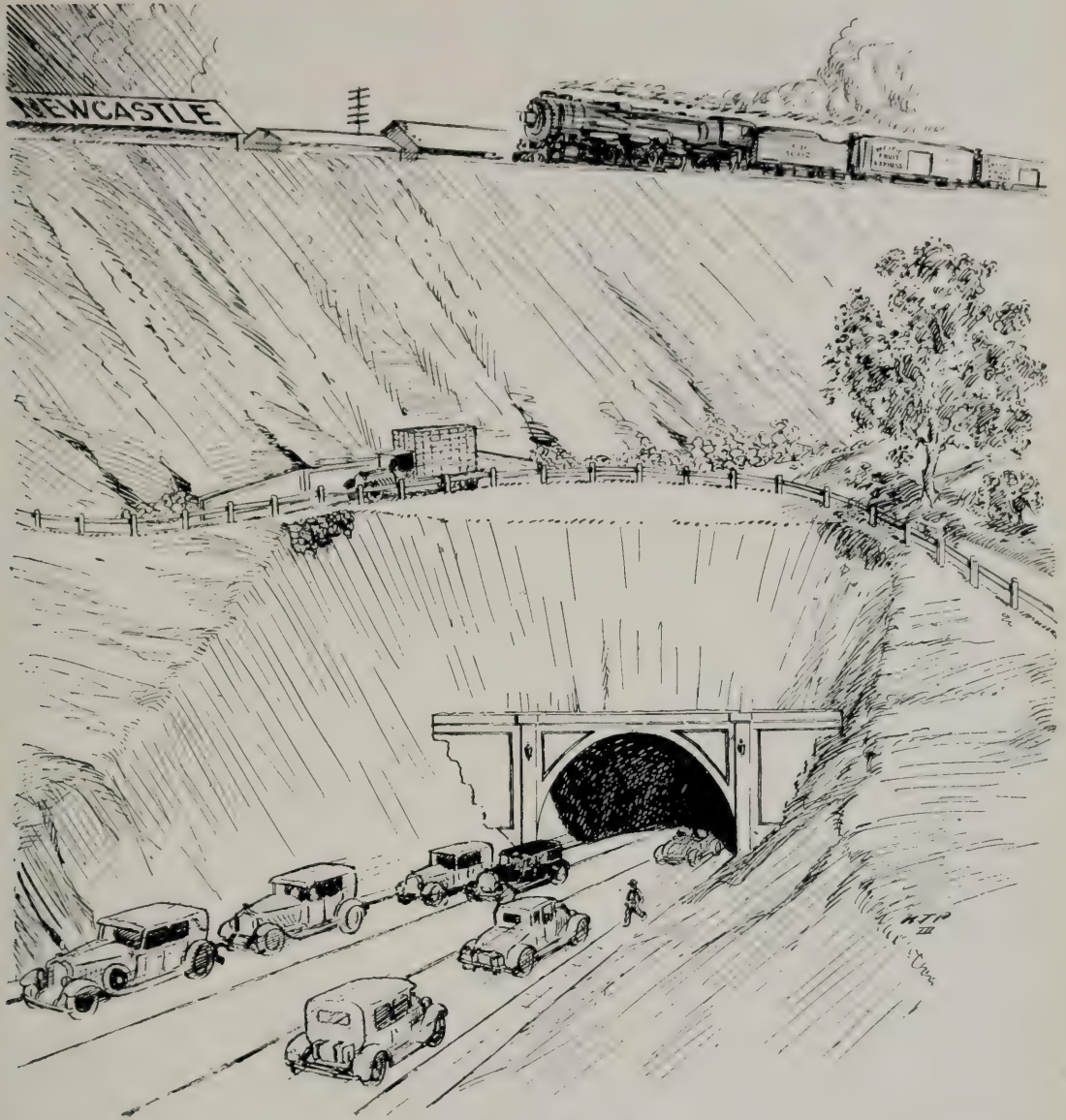
MIXER AT PORTAL

Concrete Lining—The mixer was placed at east portal at an elevation that would permit discharging direct into the mine cars which were operated on top of the core.

The concrete gun was placed directly below the mixer outlet. Concrete was dumped from the mixer into a one-batch hopper, then into a 7 cubic foot hopper, gun capacity, and then directly into gun. The gun had a 6-inch discharge pipe and operated under 100 pounds pressure.

The three lower panels, with a vertical height of 15 feet were poured by gravity in 60-foot sections, using 4½ yard mine cars.

The top five panels were poured monolithic in sections up to 60 feet in length with the concrete gun.



New Routing Relieves City Congestion

(Continued from page 15)

street is the main business artery of Santa Clara, with car tracks, safety zones and parallel parking reducing the available traffic lanes to one each way. Under a cooperative agreement with the city, a realignment of the State route through Santa Clara was adopted to modern standards through residential and industrial districts and construction along this line is now well under way and paving should be completed by early summer.

The new routing fellows along Clay and Grant avenues from the westerly city limits to the San Jose city boundary and the improvement consists of placing Portland cement concrete pavement and asphalt concrete pavement. The basis of cooperation on this project provides for the State paying for the cost of paving a strip equal to a total width of 40 feet throughout the entire length of the project. The city of Santa Clara and an assessment district are financing the remainder of roadway work, paving, sidewalks and curbs, reconstructing drainage structures and moving obstructions.

At the northerly entrance to Fresno on the State highway the city plans the construction of a grade separation with a 40-foot roadway under the tracks of the Southern Pacific Railroad, on Belmont Avenue, with adequate approaches and street connections. The State has agreed to contribute \$70,000 towards this improvement, the remainder of the expense to be borne by the city of Fresno, the railroad and the county.

Through Bakersfield the route of the State highway will be shortened more than a mile by crossing the tracks of the Southern Pacific Railroad at Beardsley School and paralleling the railroad from Chester Avenue to Union Avenue which connects with the State route entering Bakersfield from the south. The State will spend between six and seven hundred thousand dollars towards this relocation, including new bridges across the Kern River and Beardsley Canal.

PAVEMENT COMPLETED

On the Foothill Boulevard which connects San Bernardino and Los Angeles, a cooperative project was recently completed through Uplands which replaced the old 18-foot pavement with a 30-foot asphalt concrete pavement and adequate shoulders and curbs. In

this instance the construction was done by the State and the city provided the necessary additional right of way.

In the city of Davis, Yolo County, the route of the State highway has recently been widened and paved with asphalt concrete 46 feet in width with a total width between curbs of 50 to 56 feet. The State contributed the cost of a 30-foot asphalt concrete pavement; the remainder of the work, including the additional 16 feet of paving, the shoulders, curbs and gutters, was paid for by the city of Davis and Yolo County.

Where the Los Angeles-Sacramento arterial passes through Lodi, in San Joaquin County, the old 20-foot Portland cement concrete pavement was widened to 76 feet. The work was done under a contract by which the State was placing new pavement north and south of Lodi. The State paid for 20 feet of the widening and the city and a county assessment district provided the funds for the remaining 36 feet.

LARGE COAST PROJECT

One of the larger cooperative projects now under way involves the placing of a 40-foot Portland cement concrete pavement with an 80-foot roadbed on the Coast Boulevard in Los Angeles County between Washington Boulevard and El Segundo. The State is paying for three-quarters of the cost of this work and Los Angeles County is providing funds for the remaining one-quarter.

On this section there is to be constructed a grade separation carrying Culver Boulevard and the tracks of the Pacific Electric Railway over the State highway. The building of this structure will be on a cooperative basis, the cost being divided between Los Angeles County, the State and the Pacific Electric Railway.

On this same route the State is now placing a similar improvement between Corona del Mar and Laguna Beach. Where the pavement passes through Laguna Beach, Orange County is to pay for one-fourth of the pavement width.

CITY VOTES BONDS

Further cooperative work contemplated for this highway along the coast will shortly be undertaken through the city of El Segundo. In this instance the city is securing a 100-foot

State, County and City Cooperating on Coast Improvement

(Continued from preceding page)

right of way on an alignment approved by the State. The city will grade a roadbed 80 feet wide and construct curbs 76 feet apart. A 40-foot pavement will be placed in the center and an oiled macadam surface placed on each side between the pavement and curbs.

The State will pay for a 30-foot width of pavement and a proportionate share of the grading and drainage structures while the remaining cost will be borne by the city of El Segundo and Los Angeles County. Bonds have already been voted by the citizens of El Segundo to defray their portion of the cost.

Orange County has agreed to donate \$36,000 to the city of Fullerton for their share in widening the present 30-foot roadbed to 50 feet and resurfacing the existing 20-foot asphalt concrete pavement with 56 feet of asphalt concrete, on the Coast Route between the Pacific Electric Railway arch bridge and the northerly city limits in Fullerton. **The improvement will also involve the widening of the existing 24-foot overhead structure across the tracks of the Union Pacific Railroad to a full 56-foot roadway.**

At the northerly entrance to San Diego, from the Torrey Pines grade to Atlantic Street the city is securing a 100-foot right of way and has let a contract for grading and drainage structures on the basis of plans and specifications approved by the State. Upon completion of this work the State will place a 30-foot pavement over portions, and a 20-foot one-way pavement over the portion from the top of the Torrey Pines grade to the north end of the Rose Canyon Road, which will parallel the existing pavement and preserve the roadside trees. The cooperative grading and paving of the Rose Canyon cut-off was completed last year as a unit of the general agreement for work on this route within the city limits of San Diego.

WILL END CONGESTION

In the city of Ventura the State will cooperate in the widening of the Meta-Garden-Main Street route through the city. The citizens of Ventura voted a \$100,000 bond issue to assist in the financing of this improvement, which will relieve one of the most congested conditions in this section of southern California.

Allied Truck Owners Thank Governor Rolph

The Honorable James J. Rolph, Jr.,
State Capitol,
Sacramento, California.

Sir:

During many of our recent meetings, even in the southern part of our State, there has been considerable comment concerning the accomplishment of yourself, and your Board of Public Works, in keeping the Donner Summit Road open to the public. Our check indicates that between seventy-five and one hundred twenty-five commercial vehicles travel that road daily. The companies that operate trucks over this route have communicated with us, pointing out the effort that had been expended in keeping that road clear, and needless to say, they feel very kindly toward your administration.

The fact that for the first time in the history of California, this road has been open to the public this far into the winter, certainly indicates that the Board of Public Works is under capable supervision. It would have been an achievement under ordinary weather conditions to have kept the Donner Summit Road open, but to have accomplished this feat this year, in view of the terrific storms and heavy snow falls, is an outstanding achievement.

The motor truck industry of California, whom we represent, wishes at this time to take the opportunity to thank you and your Board of Public Works for the splendid work and spirit that has been shown in keeping this road open.

Our organization represents the entire motor truck industry and all of its phases. We are represented in one hundred and one different cities throughout the State of California, embracing every classification of operator, the private owners of trucks, franchise and contract carriers, city draymen and contractors, the motor truck trailer and tire manufacturers, and the three hundred thousand men that are employed in the motor truck industry.

NATHAN J. ELLIOTT

Executive Vice President and General
Manager Allied Truck Owners

Other cooperative projects which have been completed or are contemplated for the current biennium include improvements within the following cities:

Alturas	Sonora
Susanville	Modesto
Crockett	Oakdale
Vallejo	Plymouth
Kingsburg	Willows
Huntington Beach	Sutter Creek
Pasadena	Claremont
San Bernardino	Glendora
Anaheim	El Cajon

Impressive Ceremonies Mark Official Start of Work on Transbay Bridge

THE San Francisco-Oakland Bay Bridge was officially started toward construction at impressive ceremonies held on Yerba Buena Island, Wednesday, February 24, in the presence of over two hundred State, county and city officials, and civic leaders. Admiral William C. Cole, Commandant of the Twelfth Naval District, officially presented to Governor James Rolph, Jr., the necessary federal permits to construct the bridge.

Admiral Cole, on behalf of the Army, Navy, and Department of Commerce, Lighthouse Service, presented Governor Rolph with a joint permit signed by C. F. Adams, Secretary of the Navy; E. S. Morgan, Acting Secretary of Commerce; F. H. Payne, Acting Secretary of War, granting to the State of California the right to construct the bridge across Yerba Buena Island.

Admiral Cole also presented a permit signed by Secretary of War Hurley, granting the State official permission to construct a bridge from Rincon Hill in San Francisco via the island to the Key Route Mole.

MILITARY WELCOME

Full military honors were accorded to Governor Rolph and the invited guests. Special launches conveyed them to the island, where Governor Rolph was given a seventeen-gun salute when Admiral Cole's official barge approached the landing. Similar honors were extended upon departure of the barge, which flew the Governor's official flag.

At the administration grounds where the ceremonies took place a full guard and band was paraded, and the party honored by four ruffles and flourishes. The program included:

Official welcome from Admiral Cole and address by Colonel Walter E. Garrison, State Director of Public Works, outlining the purpose of the ceremonies and the San Francisco-Oakland Bay Bridge project;

Short talks by: Brigadier-General Joseph C. Castner, U. S. A., and Captain H. W. Rhodes, U. S. Lighthouse Service, to which Governor Rolph responded on behalf of the State.

NOTABLES IN PARTY

Following the ceremonies the Governor and his official party were entertained in the quarters of Admiral Cole. Included in the Governor's official party were:

Colonel Garrison, Director of Public Works; Adjutant General Howard, National Guard of California; James I. Herz, Deputy Director, State Department of Public Works; C. H. Purcell, Chief Engineer, San Francisco-Oakland Bay Bridge; Chief Justice Wm. H. Waste, State Supreme Court; Lieutenant-Commander H. G. Nelson, Admiral Cole's Aide; Mark L. Requa, Chairman Hoover Bridge Commission; E. B. DeGolia, Chairman San Francisco-Oakland Bay Bridge Advisory Committee; George Hearst, Publisher, San Francisco Examiner; George T. Cameron, Hoover Commission; Herbert Fleishhacker, President, Anglo-London & Paris National Bank; Prof. Charles D. Marx, Hoover Bridge Committee; Senator Arthur H. Breed, Hoover Bridge Committee; Senator Roy Fel-lom, Author Bridge Legislation and Representative State Senate; Speaker Edgar C. Levey, Representing State Assembly; H. J. Brunnier, Bridge Consulting Board; Hon. U. S. Webb, Attorney General; A. J. Cleary, Chief Administrative Officer, San Francisco; P. W. Meherin, Chairman Harbor Commission Board; Edward Rainey, State Superintendent of Banks; J. J. Tynan, State Board of Harbor Commissioners; Charles E. Andrew, Bridge Engineer, San Francisco-Oakland Bay Bridge; Mayor Fred W. Morcom of Oakland; City Manager Ossian Carr of Oakland; Mayor T. E. Caldecott of Berkeley; City Manager Hollis Thompson of Berkeley; Prof. Charles Derleth, Jr.; Harrison Robinson of Oakland; Joseph R. Knowland, Publisher of the Oakland Tribune, and other notables.

MODERNISTIC DESIGN

While presentation of the permits marks the official beginning of the bridge project, preliminary work has been under way for several months. During the past month sufficient boring and design data has been gathered to practically determine the double



A MODERN SKYSCRAPER rising from the middle of San Francisco Bay will be the impression created by the center anchorage of the San Francisco-Oakland Bay Bridge, according to the design submitted by Chief Engineer C. H. Purcell to Col. Walter E. Garrison, Director of Public Works. The modernistic mass of concrete and steel will tower 300 feet above the water and allow several hundred feet clearance above the crow's nest of the battleship California shown in this picture drawn to scale.

suspension type of span with central anchorage for the West Channel.

A modernistic design of the center anchorage, which represents the best thought of the engineering staff to date was presented to Director Garrison yesterday by Chief Engineer Purcell. This design calls for two independent suspension bridges with an anchorage in the center of the bay between the San Francisco shore line and Yerba Buena Island. This type, which is being considered the continuous suspension type, consists of two 2300-foot main spans and four 1150-foot side spans. To join the two independent structures, a center anchorage is

required to which the cable from each side structure will be secured, according to Design Engineer Glenn B. Woodruff.

The design shows the center anchorage in comparison with the battleship California, which is reproduced to true scale. The center anchorage as designed would be 120 x 212 feet, and 300 feet above the water. It would be built of concrete and steel. The California, shown in comparison, is 125 feet high to the top of the crow's nest.

The bridge engineering staff, according to Director Garrison, is now engaged in perfecting the design for the remainder of the structure. It will also produce a complete

(Continued on page 39)

Governor Officiating at Ceremonies for Twenty-Eight New Buildings

1 1 1 1 1 1

GOVERNOR JAMES ROLPH, Jr., has arranged to be present and participate in seven dedication ceremonies of newly erected public buildings, nine ground breaking ceremonies of buildings on which work is about to begin, and one corner stone laying during the period between February 29th and April 14th, inclusive.

Twenty-eight buildings in various parts of the State will figure in the Governor's itinerary. They represent units with a total cost valuation of \$2,940,500 in the State's construction program being pushed to completion through the Division of Architecture.

Ceremonies in which the Governor participates are as follows:

Date	Time	Place	Estimated cost
March 4th		NAPA STATE HOSPITAL	
	3 P.M.	Ground Breaking—Additions to Ward Buildings -----	\$81,000
March 8th		CALIF. NATIONAL GUARD—PASADENA	
	2 P.M.	Ground Breaking—Armory-----	50,000
March 14th		FRESNO STATE TEACHERS COLLEGE	
	2 P.M.	Ground Breaking—Library Building-----	177,000
March 21st		CALIF. NATIONAL GUARD—SALINAS	
	11 A.M.	Ground Breaking—Armory-----	60,000
March 22d		AGNEWS STATE HOSPITAL— (Santa Clara County)	
	2 P.M.	Dedication—	
		Ward Unit No. 1 at Farm-----	\$340,000
		Ward Unit No. 2 at Farm-----	340,000
		Employees' Quarters at Farm--	100,000 780,000
April 7th		STOCKTON STATE HOSPITAL	
	2 P.M.	Dedication—	
		Hospital Building-----	100,000
		Industrial Building-----	25,000
		Employees' Building-----	40,000 165,000
	3 P.M.	Ground Breaking—	
		Kitchen and Dining Room-----	125,000
March 30th		PACIFIC COLONY, at Spadra, (Los Angeles County)	
	2 P.M.	Dedication—	
		Hospital Building -----	113,000
		Administration Building-----	33,000
		Employees' Bldg. and Garages	60,000 206,000

(Continued on page 35)

Resolutions Urge Federal Aid Bills

AT ITS MEETING held at El Centro on February 5, 1932, the California Highway Commission passed the resolution hereinafter set forth urging the passage of the bills now pending in Congress providing for the continuation of Federal aid in highway building in California.

United States Senator Tasker L. Oddie of Nevada and Congressman Ed. B. Almon of Alabama have introduced two bills identical in their nature to accomplish this purpose.

These bills provide for the following appropriations:

1. For Federal Aid Highways: The sum of \$125,000,000 for the fiscal year ending June 30, 1934; and the sum of \$125,000,000 for the fiscal year ending June 30, 1935. The apportionment to California would total \$8,200,000 for the two years.

2. For Forest Roads and Trails: The sum of \$12,500,000 for the fiscal year ending June 30, 1934; and the sum of \$12,500,000 for the fiscal year ending June 30, 1935. California would receive \$2,856,000 for the biennium.

3. For Roads through Unappropriated or Unreserved Public Lands, Nontaxable Indian Lands or other Federal Reservations other than the Forest Reservations: The sum of \$3,000,000 for the fiscal year ending June 30, 1932, the sum of \$3,000,000 for the fiscal year ending June 30, 1933, and the sum of \$3,000,000 for the fiscal year ending June 30, 1934. California's share of these funds would total \$690,000.

The text of the resolution follows:

"WHEREAS, There have been introduced in Congress Bills S. 36 (Senator Oddie, Author) and H. R. 4716 (Representative Almon, Author), providing for Federal Aid Highway, Forest Road and Public Land Road appropriations for the fiscal years 1934 and 1935, and

WHEREAS, The continuation of these Congressional authorizations in the full amounts set forth in said bills as originally introduced are vital to the welfare of a large section of the population of California and the only construction of magnitude now being carried on is the highway work widely distributed to relieve the serious unemployment situation, and it is necessary to have Congressional authorizations in advance in order that the biennial budget of this State can make the necessary provisions for budgeting funds to match Federal Aid, and

WHEREAS, This Commission's financial plans contemplate the continuation of Federal Aid Highway and Forest Road appropriations, and

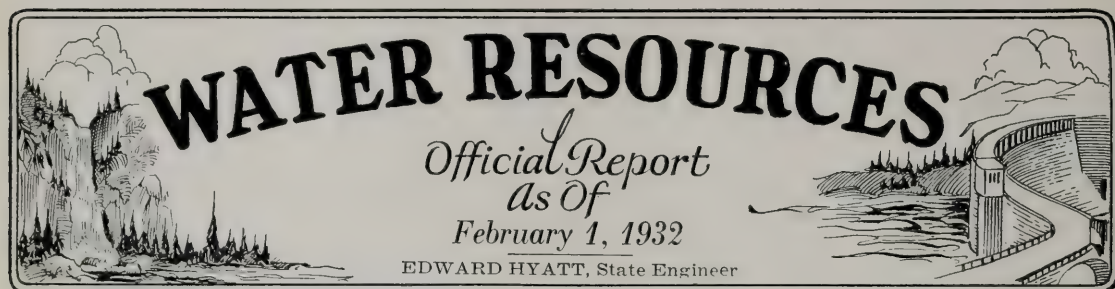
WHEREAS, Federal work through the Government's own forests on account of

the lack of Forest Road appropriations in the past has lagged behind California's own work outside the forests, and

WHEREAS, California has made and is now making heavy expenditures on the Forest Road System and assumed the entire construction costs of many of these roads, for which reason this Commission believes that a cut in the Congressional authorization for such purpose would not be equitable to this State, and

WHEREAS, The continuance of the appropriation for roads over Public Lands is particularly important and essential to Southern California which has large areas of public lands,

RESOLVED, That the California Highway Commission does hereby strongly urge the passage of said Bills S. 36 and H. R. 4716 in the amounts as originally set forth in said bills, and the Secretary of this Commission is hereby directed to send copies of this resolution to the members from California of the Senate and the House of Representatives of the United States."



The success of the Fresno Irrigation District in completing the retirement of its entire bonded indebtedness of \$2,000,000 in ten years and the approval of the All American Canal project involving a possible expenditure of \$38,500,000 are two important news items in the report of State Engineer Edward Hyatt covering the activities of the Division of Water Resources in January. The increased flow of the Sacramento River caused by December storms has entirely eliminated salinity in the Sacramento Delta, the report says in giving details of reclamation, and flood control projects, tabulations of dam applications and other work of the Division as follows:

Office work on irrigation districts during the month consisted of the completion and indexing of Bulletin 18, a revision of California irrigation district laws, and the preparation of reports on various irrigation district matters coming before the Districts Securities Commission.

The Fresno Irrigation District, by the payment of \$225,000 on January 1, 1932, retired its entire bonded indebtedness which amounted to \$2,000,000. Retirement was accomplished within a period of ten years, during which time, in addition to providing funds for the payment of bonds, the district expended approximately \$580,000 for permanent improvements to its irrigation system.

The California Districts Securities Commission has established its offices at 620 State Building, San Francisco, California, and at a meeting held on December 21, confirmed the appointment of Harmon S. Bonte as Executive Secretary of the Commission. At the same meeting, \$69,000 refunding bonds of Scott Valley Irrigation District, located in Siskiyou County, were approved for certification, and a hearing was held on the application of the Imperial Irrigation District Imperial County, for approval of a contract between the District and the United States Government for the construction of the All-American Canal, a project involving the possible expenditure of \$38,500,000.

CANAL PLAN APPROVED

On December 30, the Commission held a meeting in Los Angeles, at which a report was made by the State Engineer on the feasibility of the All-American Canal and the project was approved by the Commission. The Commission also approved expenditures of \$33,452 by the Serrano Irrigation District and \$32,789 by the Carpenter Irrigation District for completion of the Santiago Creek Dam, located in Orange County.

At a meeting of the Districts Securities Commission held in San Francisco on January 8, the request of the Waterford Irrigation District, Stanislaus County, for the issue of refunding bonds in the amount of \$631,925, representing all of its outstanding bonded indebtedness was approved. At this meeting the Palmdale Irrigation District, Los Angeles County, presented a request for the approval of a refunding bond issue in the amount of \$445,000 to be exchanged for the same amount of its outstanding bonds.

DAMS

To date 790 applications have been received for approval of dams built prior to August 14, 1929; 89 for construction or enlargement; and 231 applications for repairs or alterations.

a. Applications for Approval of Plans for Construction of Dams.

Dam	Owner	County
Greenspot	Western Fruit Growers, Inc.	San Bernardino

b. Applications for Approval of Plans for Repairs or Alterations.

Twelve such applications have been received during this period.

c. Plans Approved for Construction or Enlargement.

Dam	Owner	County
Walker	Walker Mining Company	Plumas
Upper Hollywood	City of Los Angeles	Los Angeles

d. Plans Approved for Repairs or Alterations.

Dam	Owner	County
Little Boulder Lake	Buckeye Placer Mines, Inc.	Trinity
East Lost Lake	R. W. Bassman, et al.	Alpine
West Lost Lake	R. W. Bassman, et al.	Alpine
Millbrae No. 2	Mills Estate, Inc.	San Mateo
Stanislaus Forebay	Pacific Gas and Electric Company	Tuolumne
Lower Spencer Lake	Wm. A. Hood	Sierra
Bear Valley	Bear Valley Mutual Water Co.	San Bernardino
Crouch	Chas. S. Crouch, et al.	San Diego
Lafayette	East Bay Municipal Utility Dist.	Contra Costa
"C"	Cooperative Land & Livestock Co.	Modoc
Fairchild	Cooperative Land & Livestock Co.	Modoc
"N"	Cooperative Land & Livestock Co.	Modoc
Round Valley	Cooperative Land & Livestock Co.	Modoc
Cowell Reservoir	Mcoss Beach Produce Company	San Mateo
Foxley	C. E. Foxley	Riverside

FLOOD CONTROL AND RECLAMATION

a. Maintenance of Sacramento Flood Control Project.

During the last ten days of December a general storm occurred over the watershed of the Sacramento River and its tributaries, which filled all rivers

By-Pass Channels Flooded by Storm

(Continued from preceding page)

and flood channels of the Sacramento flood control system to a low flood stage. Protective works were not threatened at any point, and in most places an additional rise of five feet would have resulted in no particular danger. During this period it was necessary to discontinue all maintenance activities with the exception of levee patrol and operation of the drainage pumping plants. It was necessary to place all pumping plants in full operation.

All of the by-pass channels were flooded and it was necessary to discontinue maintenance clearing work, but this has been resumed with a force of about eighty men in the upper Sutter By-pass within the last week.

Good progress has been made in the establishment of maintenance headquarters near Sutter City. The tract has been graded and the concrete floors and foundations for the buildings are finished. The buildings will probably be completed and ready to be occupied by March 1st.

The clearing of the flowage area in the Knights Landing Ridge Cut was completed with the exception of two days work at the time the storm occurred.

b. Sacramento Flood Control Project.

The work of clearing the timber and brush opposite the openings in the Southern Pacific embankment in the Yolo By-pass west of Sacramento has been completed.

Clearing in the lower Sutter By-pass under contract with A. F. Johnston is approximately 65 per cent complete.

c. Emergency Flood Protection and Rectification of Rivers.

The work of clearing the channel of the Santa Ynez River in cooperation with the county of Santa Barbara, near Lompoc, is 90 per cent complete, but the work was interrupted by the storm. Work will be resumed on January 25th.

River rectification work on the San Jacinto River has continued and additional funds have been provided, making the total amount to be spent \$6,000. This work will be completed before January 30th.

d. Sacramento Flood Control Project—Bank Protection.

No actual work of bank protection is now under way. The recent storm developed weaknesses in the river bank at certain places. Some of these have been examined preparatory to arranging for protective works.

In Reclamation District No. 70, in Sutter County at Girdner Bend, protection is needed for a distance of about 400 feet. Surveys have been made and plans are under preparation for doing the necessary protective work in cooperation with Reclamation District No. 70.

e. Pajaro River.

During the December storm the Pajaro River broke over its banks in several places and several thousand acres of the Pajaro Valley were flooded, including a portion of the city of Watsonville.

Under Chapter 524, Statutes of 1929, two small pieces of levee are being constructed in cooperation with local landowners at a cost of about \$3,000.

f. Russian River Jetty.

A severe storm occurred on the coast in the last week of December, which resulted in damage to the jetty amounting to approximately \$7,000. The new steel trestle is little damaged, but on the old structure approximately 150 feet of track was taken out and about 40 feet of the old portion of the pile wall. Considerable rock was displaced, but it still remains within the jetty section. The track to the quarry was seriously damaged and the connection between the mainland and the quarry was completely washed out. Of the total damage, about \$3,000 is to track, trestle and structure and \$4,000 of the loss is on account of displaced rock.

g. Flood Measurements and Gages.

At several stations where it is intended to make flood discharge measurements from bridges, the stationing was painted on the bridges. Dixon Ridge station was inspected and missing floats, flags and stationing replaced. At the metering station on Sacramento By-pass, floats made fast to anchors were set at 100-foot intervals across the section. A cross-section was taken at the cable at Rattlesnake Bridge. The new station on the middle fork of the American River near Auburn was inspected and a cross-section taken at the cable. During the recent storm one discharge measurement was made at Rattlesnake Bridge.

On January 12th a conference was held to discuss operation of gages and measurement of floods. A complete schedule for flood measurements for season 1931-32 was decided upon.

WATER RIGHTS

a. Applications to Appropriate.

Thirty-five applications to appropriate water were received during the month of December, 14 were denied, 16 were approved and 14 permits were revoked.

Four rather important municipal filings were made during the month; 2 by the city of Fresno involving appropriations from San Joaquin River for municipal water supply purposes and irrigation at an estimated total cost of \$10,000,000. The other two filings referred to were those by the city of San Luis Obispo involving diversions from Lopez Creek, a tributary of Arroyo Grande Creek, for municipal water supply purposes.

On December 12th an application of the Benbow Power Company, Benbow, Humboldt County, was approved allowing an appropriation of 320 cubic feet per second from South Fork of Eel River for the generation of power with which to supply Benbow resort and vicinity.

Preparation of inspection reports covering field investigations made during the last field season is in progress and since October 15th more than 1300 progress reports of permittees and licensees have been received and analyzed.

Large Increase in State Road Traffic Indicated for 1932

THE gain in motor vehicle registrations in California in 1931 despite depressed business conditions and information received from tourist bureaus throughout the country indicate that 1932 will see more motor traffic on the state highways than ever before in the history of California.

The increase in tourist visitors registered in 1931 will be largely augmented this year by the attraction of the Olympic Games and the lure of California's good roads in addition to another expected increase in auto registrations.

State registration totals made public by the Department of Motor Vehicles show fee-paid registrations for the year amounting to 2,107,275.

101,554 Nonresidents

This figure includes motorcycles and trailers but does not include the 38,199 vehicles registered in the State under the exempt license classifications nor the 101,554 cars that were driven into the State during the year by nonresident drivers.

The net gain in fee-paid vehicles over 1930 was 7982. Most of the gain came in commercial vehicles equipped with pneumatic tires, there being an apparent tendency among business men to equip during the year with commercial vehicles somewhat heavier and larger.

"The gain is not large but is encouraging and shows we are holding our own pretty well."

Fee-Paid Vehicles

This was Registrar Russell Bevans' comment on the figure. Here are the comparative fee-paid vehicles registered in 1930 and 1931:

Autos -----	1,941,969	1,938,068
Solid trucks ----	15,500	11,271
Pneu. trucks ----	83,887	93,942
Motorcycles ----	9,405	8,970
Solid trailers ---	9,563	8,274
Pneu. trailers ---	38,969	46,750
	2,099,293	2,107,275

The totals will be used as a basis for apportioning motor vehicle license funds to the various counties and to the State Department of Public Works for highway purposes. The motorist thus gets his money back in the form of good roads.

As in past years more than one-third of all vehicles in the State were registered from Los Angeles County. San Francisco was second and Alameda third.

DOWN ON THE FARM

Nearly three-fifths of the farms in the United States have automobiles, according to a report of the Department of Commerce. These census statistics show that fifty-eight per cent of the farms of the country have automobiles and that a considerable number have more than one car. The percentage of farms owning motor trucks was given as 13.4, slightly less than the percentage owning tractors. Of the 3,650,003 farms reporting, there were 4,134,675 automobiles listed.

Cloverdale-Hopland Project Started by Official Ceremony

EARL LEE KELLY, Chairman of the California Highway Commission, officially representing Governor James Rolph, Jr., turned the first spadeful of dirt symbolizing commencement of construction on the Cloverdale-Hopland relocation project on Route 1, Redwood Highway, Sonoma and Mendocino counties.

This ceremony took place as a climax of the "Ground-breaking Jubilee" held in Cloverdale Sunday, February 21st, under the direction of the Redwood Empire Association, jointly sponsored by this association and the Cloverdale Chamber of Commerce.

Several thousand leaders from various parts of the Redwood Empire were in attendance, including the Boards of Supervisors, Chambers of Commerce, Farm Bureaus, and Grange representatives, newspaper publishers, and others.

OFFICIALS WHO SPOKE

H. G. Ridgway of San Rafael, vice president, and chairman of the Events Committee of the Redwood Empire Association, presented the following State Highway officials during the speaking program: Colonel Walter E. Garrison, director of the State Department of Public Works; Earl Lee Kelly, chairman California Highway Commission; C. H. Purcell, State Highway Engineer; John W. Howe, secretary of the Commission; Colonel Jno. H. Skeggs, Engineer District No. 4 of the Highway Division, H. S. Comley, new Engineer for District No. 1 of the Highway Division.

Other State officials on the speaking program included: Senator Herbert Slater, Sonoma County, Senator R. R. Ingels, Mendocino and Lake counties, Wallace L. Ware, Santa Rosa, and Assemblyman Hubert Scudder.

Harry Lutgens of San Rafael, as president of the Redwood Empire Association, presented the greetings of the nine counties. Supervisor Ed. Enzenauer, chairman of the Board of Supervisors, Sonoma County, and N. P. Howe, director of Mendocino County Chamber of Commerce, spoke for their respective counties.

ATTENDED CITRUS FAIR

Others on the speaking program included: George Cavalli, president Cloverdale Chamber of Commerce; Chas. E. Humbert, Mayor of Cloverdale; D. G. MacMillan, Hopland Board of Trade; F. C. Yates, Ukiah Chamber of Commerce; J. A. McMinn former chairman of the Board of Supervisors, Sonoma County; Charles Sedgley, banker of Cloverdale; J. P. Menihan, secretary Cloverdale Chamber of Commerce, and Mr. Granfield, representing the contractors, Granfield, Farrar & Carlin.

At the same time the 34th Annual Citrus Fair was in progress, to which the above officials were invited as guests.

Chairman Earl Lee Kelly was the principal speaker during the afternoon at the Citrus Fair. The motif of the occasion being Colonial in honor of the sesqui-centennial birthday of George Washington. Chairman Kelly delivered an interesting cogent and informative address descriptive of the life of Washington.

Immediately after the morning celebration and jubilee, the Cloverdale Chamber of Commerce entertained their guest with a colorful and tasty buffet luncheon in true wetsern style.



DIGGING IN to start a great highway project Chairman Earl Lee Kelly of the California Highway Commission is shown breaking ground on February 21 for the Cloverdale-Hopland improvement. Left to right, are Senator R. R. Ingels of Mendocino County looking over the shoulder of State Highway Engineer C. H. Purcell; H. G. Ridgway, vice president Redwood Empire Association; Earl Lee Kelly; Harry Lutgens, president Redwood Empire Association; Miss Hazel Hurt, Cloverdale; Colonel Walter E. Garrison, Director, Department of Public Works; Colonel Jno. H. Skeggs, District Engineer; Supervisor Willard Cole, Sonoma; Mayor Charles E. Humbert, Cloverdale.

Ten Year Plan Involves Big Savings

(Continued from page 1)

This economic procedure of development requires that the original alignment, grade and drainage features be so established that development may be carried forward from one improvement to the next without loss of the original investment. While this careful method of highway planning requires expenditures at the earlier stages of development which may seem out of proportion to existing traffic needs, when viewed over the longer period of time it is readily seen that the method resorted to involves considerable savings.

Upon this basis of long time planning, the best engineering practice is made possible. The best economic balance may be obtained

in the selection and alignment of routes, and the most desirable gradient attained with prudent expenditures of funds.

The standards of construction to which the Division of Highways adhered in making up the ten year plan have been the highest for the various types of roads which go to make up the system.

The success of the ten year economic plan of highway construction based upon the present basis of revenue allocation, and the possibility of the State having a unified system of highways which will provide an adequate service to the public at the end of the period is dependent upon following the development plan along its general lines.

Sacramento Delta Salinity Eliminated

(Continued from page 27)

ADJUDICATIONS

Shasta River (Siskiyou County). Case pending in Superior Court of Siskiyou County.

Whitewater River (San Bernardino and Riverside counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

North Cow Creek (Shasta County). An amended stipulation for judgment has been signed by all parties and filed with the Superior Court of Shasta County. The Court's decree defining the water rights on North Cow Creek, based upon the amended stipulation, will be entered at an early date.

Oak Run Creek (Shasta County). Case pending in the Superior Court of Shasta County awaiting action by the parties involved.

Clover Creek (Shasta County). The Clover Creek case came up for hearing in the Superior Court of Shasta County on January 18, 1932.

Butte Creek (Siskiyou County). Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Davis Creek (Modoc County). Case pending in Superior Court of Modoc County awaiting entry of Court's decree.

Mill Creek (Modoc County). The Mill Creek case, referred to the Division by the Superior Court of Modoc County by Order of Reference dated May 1, 1929, was terminated by a decree entered by the Court on December 19, 1931. This decree adjudicated water rights to the extent of 3.00 cubic feet per second for power purposes and 35.83 cubic feet per second for irrigation, domestic and stock-watering purposes on 2204 acres of land. The water rights defined by the decree are appurtenant to 43 property tracts served by 65 diversion conduits.

Following entry of the decree, the Mill Creek Water Master District was created by order of the State Engineer, dated December 30, 1931, in accordance with the provisions of Section 37 of the Water Commission Act. A petition dated January 14, 1932, requesting appointment of a water master for the district, as provided for in Section 37a of the above mentioned act, has been received by the Division.

Deep Creek (Modoc County). The Division's report covering the distribution of the waters of Deep Creek, in accordance with the trial schedule of allotments adopted for the 1931 season, has been completed for circulation among interested parties.

Franklin Creek (Modoc County). The Division's report on the distribution of the water of Franklin Creek for the 1931 season has been completed.

New Pine Creek (Modoc County). The report of the water supply and use of water on New Pine Creek, covering the field investigation conducted on that stream during the 1931 season was completed January 12, 1932.

Eagle Creek (Modoc County). The report on the water supply and use of water on Eagle Creek is in the hands of the State Printing Office.

Pine and Parker creeks (Modoc County). Reports covering water master service on these streams during the 1931 irrigation season have been completed.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Except for routine maintenance of tide gage and salinity stations, the work under this project during the past month has been confined to office compilations in the preparation of the 1931 annual report which presents the results of all measurements of diversions, stream flow, return flow, use of water, salinity, etc., for the Sacramento-San Joaquin territory. The special report covering estimates of damage in 1931 due to salinity and water shortage is in course of preparation.

The storms beginning in the latter part of December caused a flow in the Sacramento River at Sacramento reaching a maximum of about 64,000 second-feet on December 29th with a probable maximum flow including the discharge of the Yolo By-pass, of around 86,000 second-feet on the first of January. The river flow at Sacramento had receded to 18,000 second-feet on January 11th. This flow of water entirely eliminated the salinity in the Sacramento Delta and early in January the salinity was down to 13 parts of chlorine per 100,000 at O. and A. Ferry.

There was, however, no corresponding large flow to the delta from the San Joaquin River and early in January the salinity at some of the San Joaquin Delta stations was still higher than at points below the delta such as O. and A. Ferry and Bay Point. The large Sacramento flow has been influential in greatly reducing the salinity at San Joaquin Delta points but not to the extent nor as rapidly as would have been the case if a corresponding large flow direct from the San Joaquin River had occurred. By January 10th the salinity had practically reached a winter minimum throughout the delta. These data are shown in the following tabulation:

SALINITY-SACRAMENTO-SAN JOAQUIN DELTA

Station	1/2/32	1/10/32
	Parts of Chlorine per 100,000	
Bay Point	22	15
O. and A. Ferry	13	19
Collinsville	9	8
Antioch	21	11
Emmaton	4	4
Webb Pump	47	16
Camp 20 Station	—	2
Central Landing	9	3
Holland Pump	27	15
Mandeville Pump	39	16
King Island	43	24
Rindge Pump	5	4
Middle River P. O.	27	5
Clifton Court Ferry	5	2

At present, sampling is being maintained at 44 stations, of which 19 are permanently maintained

(Continued on page 36)

January Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of January, 1932.

LOS ANGELES COUNTY—Application 7165. H. H. Townsend, 6039 Hollywood Blvd., Los Angeles, for 0.001 c.f.s. from unnamed spring tributary to Piru Creek Watershed to be diverted in Sec. 30, T. 6 N., R. 17 W., S. B. B. and M., for domestic and stock-watering purposes.

CALAVERAS COUNTY—Application 7166. State of California, Department of Public Works, Division of Highways, c/o C. H. Purcell, State Highway Engineer, Public Works Bldg., Sacramento, for 0.005 c.f.s. from Cottage Spring tributary to North Fork of Stanislaus River to be diverted in Sec. 28, T. 6 N., R. 16 E., M. D. B. and M., for recreational purposes. Estimated cost \$250.

DEL NORTE COUNTY—Application 7167. State of California, Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, for 0.017 c.f.s. from California Creek tributary to Elk Creek to be diverted in Sec. 34, T. 19 N., R. 4 E., H. B. and M., for recreational and irrigation purposes. Estimated cost \$1,000.

INYO COUNTY—Application 7168. Ingle Carpenter, Suite 820, Detwiler Bldg., Los Angeles, for 200 gallons per day from Rock Creek tributary to Owens River to be diverted in Sec. 6, T. 6 S., R. 30 E., M. D. B. and M., for domestic purposes. Estimated cost \$400.

EL DORADO COUNTY—Application 7169. B. W. Stone, 161 Ellis St., San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum, from (1) Rubicon River (2) Pilot Creek (3) Gerle Creek (4) Loon Lake (5) Buck Island Lake (6) Rock Bound Lake (7) Little South Fork Rubicon River tributary to American River Drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E., M. D. B. and M., Sec. 11, T. 12 N., R. 12 E., M. D. B. and M., Sec. 24, T. 13 N., R. 13 E., M. D. B. and M., Secs. 1, 31 and 34, T. 14 N., R. 14 E., M. D. B. and M., Sec. 4, T. 13 N., R. 15 E., M. D. B. and M., and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

MONO COUNTY—Application 7170. Elbert E. English, 1132 Pine Avenue, Long Beach, for 200 gallons per day from Rock Creek tributary to Owens River to be diverted in Sec. 33, T. 4 S., R. 30 E., M. D. B. and M., for domestic purposes. Estimated cost \$25.

MONO COUNTY—Application 7171. Charles O. Perkins, 1143 Vergue Ave., Pasadena, for 200 gallons per day from Rock Creek tributary to Owens River to be diverted in Sec. 33, T. 4 S., R. 30 E., M. D. B. and M., for domestic purposes. Estimated cost \$25.

PLACER COUNTY—Application 7172. Frank Dutra, Newcastle, for 0.02 c.f.s. from seepage water from Newcastle Highway Tunnel and Approach tributary to Secret Ravine, thence Linda Creek and Sacramento River to be diverted in Sec. 24, T. 12 N., R. 7 E., M. D. B. and M., for industrial and domestic purposes. Estimated cost \$225.

TRINITY COUNTY—Application 7173. C. H. Barkdull, 3646 36th Ave., S., Seattle, Washington, for (1) 30 c.f.s. (2) 4 c.f.s. (3) 6 c.f.s. (4) 6 c.f.s. (5) 4 c.f.s., total 50, from (1) Mosquito Creek (2) Big Lake (3) Ammon Creek (4) White Sides and (5) Bear Trap Creek tributary to South Trinity River to be diverted in Secs. 33, 26, 27, 11, 14, T. 5 N., R. 5 E., H. B. and M., for mining and domestic purposes.

MODOC COUNTY—Application 7174. Russell M. Bushey, Canby, for 0.25 c.f.s. from unnamed spring tributary to Pit River to be diverted in Sec. 8, T. 41 N., R. 9 E., M. D. B. and M., for irrigation and domestic purposes (20 acres). Estimated cost \$15.

SANTA CLARA COUNTY—Application 7175. H. D. Gaskill, Cupertino, for 3 c.f.s. from unnamed creek tributary to Calabasas Creek to be diverted in Sec. 24, T. 7 S., R. 2 W., M. D. B. and M., for irrigation purposes. (30 acres.) Estimated cost \$500.

MENDOCINO COUNTY—Application 7176. Harold H. Wonacott, c/o Lewis D. Mooney, Atty., Fort Bragg,

total of 2 c.f.s. (1 c.f.s. from each of 2 sources) from (1) Main Digger Creek (2) South Fork Digger Creek tributary to Pacific Ocean to be diverted in Sec. (1) 24, T. 18 N., R. 18 W., M. D. B. and M., and Sec. (2) 19, T. 18 N., R. 17 W., M. D. B. and M., for industrial purposes (trout farm). Estimated cost \$1,000.

MENDOCINO COUNTY—Application 7177. Mrs. C. Rhea, Cummings, for 1500 gallons per day from Mill Creek tributary to South Fork of Eel River to be diverted in Sec. 4, T. 23 N., R. 17 W., M. D. B. and M., for domestic purposes. Estimated cost \$225.

MONO COUNTY—Application 7178. H. C. Sheetz, 1213 N. Elm Ave., Glendale, for 200 gallons per day from Glass Creek tributary to Owens River to be diverted in Sec. 21, T. 2 S., R. 27 E., M. D. B. and M., for domestic purposes. Estimated cost \$75.

HUMBOLDT COUNTY—Application 7179. Thomas H. Selvage, Eureka, for 0.022 c.f.s. from unnamed spring tributary to Mattole Creek to be diverted in Sec. 30, T. 2 S., R. 1 W., M. D. B. and M., for irrigation and domestic purposes (8 acres). Estimated cost \$300.

MONO COUNTY—Application 7180. J. C. Feige, Bishop, for 200 gallons per day from Mammoth Creek tributary to Owens River to be diverted in Sec. 2, T. 4 S., R. 27 E., M. D. B. and M., for domestic purposes.

NEVADA COUNTY—Application 7181. Spanish Mining Co. and San Francisco Commercial Co., c/o Robert Beale, Atty., 1404 Humboldt Bank Bldg., San Francisco, for 1.5 c.f.s. from Devils' Canyon Creek tributary to Poorman's Creek to be diverted in Sec. 30, T. 18 N., R. 11 E., M. D. B. and M., for mining, milling, domestic and fire protection. Estimated cost \$6,000.

NEVADA COUNTY—Application 7182. Spanish Mining Co. and San Francisco Commercial Co., c/o Robert Beale, Atty., 1404 Humboldt Bank Bldg., San Francisco, for 3.0 c.f.s. from Poorman's Creek tributary to South Fork of Yuba River to be diverted in Sec. 31, T. 18 N., R. 11 E., M. D. B. and M., for mining, milling, domestic and fire protection. Estimated cost \$11,000.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of January, 1932.

ORANGE COUNTY—Permit 3838, Application 7109. U. S., Cleveland National Forest, 310 Federal Bldg., San Diego, January 7, 1932, for .003 c.f.s. from San Juan Creek tributary to Pacific Ocean in Sec. 3, T. 7 S., R. 6 W., S. B. B. and M., for domestic purposes. Estimated cost \$500.

SISKIYOU COUNTY—Permit 3839, Application 7105. Harry D. Maltis, Castella, January 7, 1932, for 1.00 c.f.s. from Cole Creek tributary to South Fork Indian Creek thence Indian Creek and Klamath River, in Sec. 10, T. 17 N., R. 6 E., H. B. and M., for mining and domestic purposes. Estimated cost \$20.

CALAVERAS COUNTY—Permit 3840, Application 7090. Harry D. Thompson, San Andreas, January 12, 1932, for 1000 gallons per day from Thompson Spring tributary to Murray Creek Drainage Area thence to Calaveras River in Sec. 6, T. 4 N., R. 13 E., M. D. B. and M., for irrigation and domestic purposes on 1 acre. Estimated cost \$200.

SAN DIEGO COUNTY—Permit 3841, Application 6667. Hallam C. Stone, El Cajon, San Diego County, January 12, 1932 for 0.5 c.f.s. from Campo Creek, tributary to Tecate River in Sec. 19, T. 18 S., R. 5 E., S. B. B. and M., for irrigation and domestic purposes on 70 acres. Estimated cost \$5,000.

ORANGE COUNTY—Permit 3842, Application 6720. Louis Robinson, El Toro, Orange County, January 15, 1932, for 0.75 and 80 acre-feet from Trabuco Creek tributary to San Juan Creek in Sec. 5, T. 6 S., R. 6 W., S. B. B. and M., for irrigation and domestic purposes on 182 acres. Estimated cost \$24,750.

SAN MATEO COUNTY—Permit 3843, Application 6154. George N. Keyston and William F. Leib, 50 Post St., San Francisco, January 27, 1932, for 0.95 c.f.s. and 520 acre-feet from El Corte Madera Creek

(Continued on next page)

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of January, 1932.

LASSEN COUNTY—Shugru Dam No. 239. James Shugru, Johnstonville, owner; earth, 16 feet above streambed with a storage capacity of 60 acre-feet, located in Sec. 19, T. 29 N., R. 13 E., M. D. B. and M., for storage and diversion purposes, for irrigation use.

SAN MATEO COUNTY—Reflection Lake Dam No. 606. Cuesta La Honda, Inc., San Francisco, owner; earth, 19 feet above streambed with a storage capacity of 37 acre-feet, situated on unnamed stream tributary to La Honda Creek in Sec. 14, T. 7 S., R. 4 W., M. D. B. and M., for storage purposes, for recreation use.

RIVERSIDE COUNTY—Picnic Dam No. 825. Moreno Mutual Irrigation Co., Riverside, owner; earth, 10 feet above streambed with a storage capacity of 14 acre-feet, situated on South Branch of Singleton Creek tributary to San Timoteo Creek in Sec. 26, T. 2 S., R. 2 W., S. B. B. and M., for storage purposes for irrigation use.

Applications for approval of plans and specifications for the repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of January, 1932.

SAN DIEGO COUNTY—Crouch Dam No. 839. Chas. C. Crouch, San Diego, owner; earth, situated on unnamed canyon tributary to Los Chollas Valley in Sec. 3, T. 17 S., R. 2 W., S. B. B. and M.

PLUMAS COUNTY—Taylor Lake Dam No. 288. J. L. Robinson, Reno, owner; rock, situated on Taylor Lake tributary to Hungry Creek in Sec. 35, T. 27 N., R. 11 E., M. D. B. and M.

RIVERSIDE COUNTY—Foxley Dam No. 821. C. E. Foxley, Romoland, owner; earth, situated on unnamed canyon tributary to Salt Creek in Sec. 5, T. 6, R. 3 W., S. B. B. and M.

MODOC COUNTY—"C" Dam No. 145-2. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 1, T. 44 N., R. 10 E., M. D. B. and M.

MODOC COUNTY—"N" Dam No. 145-4. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 24, T. 44 N., R. 9 E., M. D. B. and M.

MODOC COUNTY—Fairchild Dam No. 145-5. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 12, T. 43 N., R. 9 E., M. D. B. and M.

MODOC COUNTY—Round Valley Dam No. 145-8. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 8, T. 44 N., R. 10 E., M. D. B. and M.

NAPA COUNTY—St. Helena, Upper Dam No. 16. Town of St. Helena, St. Helena, owner; earth, situated on York Creek tributary to Napa River in Sec. 26, T. 8 N., R. 6 W., M. D. B. and M.

APPLICATIONS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of January, 1932.

PLUMAS COUNTY—Walker Dam No. 271. Walker Mining Co., Walkermine, owner; earth, 30 feet above streambed with a storage capacity of 25 acre-feet, situated on Little Grizzly Creek tributary to Indian Creek in Sec. 7, T. 24 N., R. 12 E., M. D. B. and M., for storage purposes, for mining use.

LOS ANGELES COUNTY—Upper Hollywood Dam No. 6-29. City of Los Angeles, Los Angeles, owner; earthfill, 72 feet above streambed with a storage capacity of 193 acre-feet, located in Sec. 34, T. 1 N., R. 14 W., S. B. B. and M., for regulation and storage purposes, for domestic use.

LOS ANGELES COUNTY—San Gabriel Dam No. 2 No. 32-5. Los Angeles County Flood Control District, Los Angeles, owner; rock, 240 feet above streambed

with a storage capacity of 14,000 acre-feet, situated on West Fork tributary to San Gabriel River in Sec. 19, T. 2 N., R. 10 W., S. B. B. and M., for storage purposes, for flood control and other uses.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of January, 1932.

TUOLUMNE COUNTY—Stanislaus Forebay No. 97-83. Pacific Gas and Electric Co., San Francisco, owner; earth, located in Sec. 5, T. 3 N., R. 15 E., M. D. B. and M.

SIERRA COUNTY—Lower Spencer Lake Dam No. 298. William Aclond Hood, Four Hills Mine, owner; rock, situated on Middle Fork tributary to North Yuba River.

SAN BERNARDINO COUNTY—Bear Valley Dam No. 803. Bear Valley Mutual Water Co., Redlands, owner; multiple arch, situated on Bear Creek tributary to Santa Ana River in Sec. 22, T. 2 N., R. 1 W., S. B. B. and M.

SAN DIEGO COUNTY—Crouch Dam No. 839. Chas. S. Crouch, et al., San Diego, owner; earth, situated on unnamed canyon tributary to Los Chollas Valley in Sec. 3, T. 17 S., R. 2 W., S. B. B. and M.

CONTRA COSTA COUNTY—Lafayette Dam No. 31-2. East Bay Municipal Utility District, Oakland, owner; earth, tributary to Lafayette Creek in Sec. 26, T. 1 N., R. 3 W., M. D. B. and M.

MODOC COUNTY—"C" Dam No. 145-2. Cooperative Land and Livestock Co., Reno, owner; earth dam, located in Sec. 1, T. 44 N., R. 10 E., M. D. B. and M.

MODOC COUNTY—Fairchild Dam No. 145-5. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 12, T. 43 N., R. 9 E., M. D. B. and M.

MODOC COUNTY—"N" Reservoir No. 145-4. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 24, T. 44 N., R. 9 E., M. D. B. and M.

MODOC COUNTY—Round Valley Dam No. 145-8. Cooperative Land and Livestock Co., Reno, owner; earth, located in Sec. 8, T. 44 N., R. 10 E., M. D. B. and M.

SAN MATEO COUNTY—Cowell Reservoir No. 615-2. Moss Beach Produce Co., Moss Beach, owner; earth, located in Rancho Corral de Tierra.

RIVERSIDE COUNTY—Foxley Dam No. 821. C. E. Foxley, Romoland, owner; earth, situated on unnamed canyon tributary to Salt Creek in Sec. 5, T. 6 S., R. 3 W., S. B. B. and M.

APPLICATIONS AND PERMITS

(Continued from page 31)

tributary to San Gregorio Creek in Secs. 20, 29 and 32, T. 6 S., R. 4 W., M. D. B. and M., for irrigation and stockwatering purposes on 898.7 acres. Estimated cost \$150,000.

SAN MATEO COUNTY—Permit 3844, Application 6155. George N. Keyston and William F. Leib, c/o Cyril Williams, Jr., 369 Pine St., San Francisco, January 27, 1932, for 0.05 c.f.s. from tributaries to El Corte Madera Creek tributary to San Gregorio Creek in Secs. 29 and 31, T. 6 S., R. 4 W., M. D. B. and M., for irrigation and domestic purposes on 120.3 acres. Estimated cost \$7,000.

SAN MATEO COUNTY—Permit 3845, Application 6156. George N. Keyston and William F. Leib, c/o Cyril Williams, Jr., 369 Pine St., San Francisco, January 27, 1932, for 0.08 c.f.s. from El Corte Madera Creek tributary to San Gregorio Creek in Sec. 29, T. 6 S., R. 4 W., M. D. B. and M., for fish culture and recreational purposes. Estimated cost \$3,000.

The ace of cads is the man who throws chewing gum in the street to see baby cars get stuck.

Words of Praise for Men Who Keep Roads Safe for Motorists

KIT CARSON and the early pathfinders were hailed as heroes during a motor-log given by Mrs. John Plover before the women of the Chamber of Commerce Auxiliary, but the present day highway maintenance men were lauded as the saviors of the traveling public.

No weather is too disagreeable nor a day too long to prevent the upkeep men of the highway organization from hastening to an impaired section of highway to make it again safe for motorists, Mrs. Plover said.

"With blind faith we follow work cars of the highway men over water covered pavement, and along tortuous ledges secure in the knowledge that they are leading us over safe roadbeds." In these words the speaker paid tribute to that vast army of men whose chief duty is to keep California highways always in repair.

Mr. and Mrs. Plover were among the motorists who escaped from the snow storms that swept through the Sierra Nevada mountains recently. In going out they ploughed through ninety miles of snow in deep ruts cut by the highway patrol cars and to safety, happy over escaping a prolonged winter outing but with a picture of snow mantled mountains that will live in their memories for years.

In closing Mrs. Plover said "And all these perfect roads cost us nothing, except the gasoline tax which is only a pittance compared to the return in comfort, safety and indescribable beauty that one meets on every hand."—*Santa Rosa Republican*.

ROAD WORK NEVER DONE

Road construction and road work are never done.

We have built thousands of miles of fine highways. But the inexorable march of progress makes more and still more roads necessary. The increased mechanization of agriculture has made it vital that the millions of farmers now living on unimproved roads be given means for fast, efficient and economical transport.

It might be said that a road dollar has never been entirely wasted.—*Pacific Market-ing Journal*.

Is "engine" a masculine or feminine word? Depends on whether or not it Mrs.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10

FEBRUARY, 1932

No. 2

Editor Tells Effect of Commission's Visit

VISIT of the California Highway Commission to Imperial Valley is certain to have considerable effect on the future of road construction in this part of the State.

In suggesting that local road enthusiasts not ask too much, the commission, in the opinion of local leaders, did not mean to infer that too much has been done here already, or that too much is expected.

It was merely a gentle hint that everything that everybody wants can not be done at once and some projects will have to wait until a later date.

Imperial County has been handsomely treated by the commission in the past few years, and the construction which is now under way or about to begin, is further evidence of the commission's recognition of the importance of Imperial County as one of the principal gateways for traffic from the east to California.

All members of the commission appeared vitally interested in Imperial Valley, not only in connection with highway matters but in the progress that has been made here and in the business activity, which several remarked exceeds that of nearly any other section of the State.

The commissioners left the impression that Imperial Valley has staunch friends at the head of the State's highway affairs and local road enthusiasts have full confidence that their interests will be given every consideration possible.—*Imperial Valley Press*.

A woman, driving into a village, asked one of several boys where she could find a Mr. Jenkins.

Said the youngster, "That's him over in front of McMicks, leaning against the wall."

The woman looked in the direction indicated, and there was Mr. Jenkins. Also she noticed, just beside where he was standing, this legend carved in the stone: "MCMIX."—*London Tid-Bits*.

First Arc-Welded Steel Viaduct for Highway Ends Grade Crossing Peril

By A. J. MEEHAN, Associate Designing Bridge Engineer

IN ACCORDANCE with the grade crossing elimination program of the Division of Highways, a structure now nearing completion has several unusual features that are of interest. The location is $2\frac{1}{2}$ miles east of Merced at the intersection of the all-year Yosemite Highway and the Atchison, Topeka and Santa Fe Railway, where a steel viaduct with field welded construction was the type adopted.

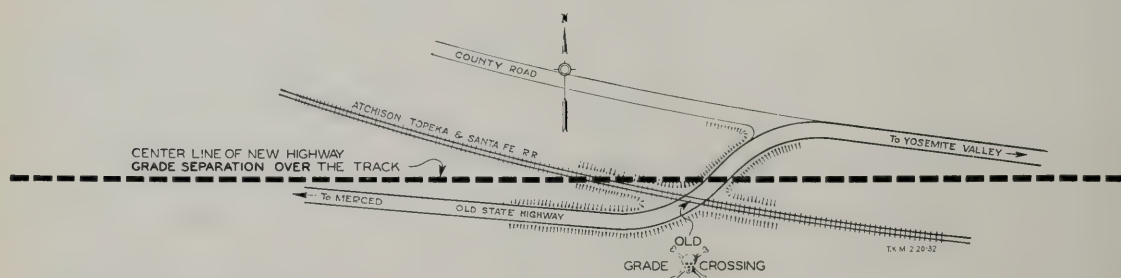
Removal of this grade crossing had become of vital importance. Extreme reverse alignment with consequent impaired sight distance and heavy railroad traffic had created considerable of a hazard to the safe and uninterrupted flow of highway traffic. Reference to the accompanying photograph of the original crossing will serve to present its dangerous alignment.

The new overhead structure is a steel viaduct 1380 feet in length consisting of 40-foot

steel beam spans on steel pile bents and 20-foot tower spans at suitable intervals to secure the necessary longitudinal rigidity. The deck is of concrete with a 24-foot clear roadway. The roadway is adapted to future widening. The project also included paved road approaches, detour and miscellaneous small structures.

Choice of steel was dictated in a measure by its slender proportions, which permitted less rise in grade and shorter spans than concrete, especially as the tracks are crossed at a severe skew. There is also the absence of falsework in the track area. Incidentally, in an overhead crossing there are certain horizontal and vertical clearances to be satisfied as set forth in the rulings of the California Railroad Commission. Provision was made for a future track on the north side of the present one.

(Continued on next page)



SAFE AND SURE, is the new alignment shown on the map made possible by the new 1380-foot viaduct abolishing the hazardous grade crossing on the all-year Yosemite Highway two and a half miles east of Merced where heavy railroad traffic prevails.



A LONG JUMP is made by this unique, welded steel viaduct carrying the highway over the railroad tracks east of Merced.



BAD SPOT, this was, where highway crossed tracks at a severe skew, impairing visibility, augmenting danger.

Dedication and Ground Breaking Events

(Continued from page 24)

Date	Time	Place	Estimated cost	
March 30th	3 P.M.	Ground Breaking—		
		Three Dormitory Buildings---	\$160,000	
		STATE NARCOTIC HOSPITAL,		
		Spadra		
	4 P.M.	Ground Breaking—		
March 31st		Superintendent's Residence---	15,000	
		Two Ward Buildings-----	35,000	
		Physician's Cottage-----	10,000	\$60,000
		NORWALK STATE HOSPITAL		
	3 P.M.	Dedication—		
April 14th		Night Attendants' Quarters--	40,000	
		Day Attendants' Quarters----	36,000	
		Physician's Cottage-----	10,000	86,000
		MENDOCINO STATE HOSPITAL		
	2 P.M.	Dedication—		
		Tubercular Ward Unit No. 7_	209,000	
		Ward Building No. 14-----	90,000	299,000
	3 P.M.	Ground Breaking—		
		Laundry Building-----		60,000

STEEL VIADUCT FOR HIGHWAY

(Continued from page 34)

The structure offers a unique example of modern construction inasmuch as ordinary steel H sections are used for piles and electric arc-welding was permitted for structure assembly. There exists no other recorded major bridge project of the welded type for highway traffic.

For some time the Bridge Department of the Division of Highways has sought to conservatively utilize welding in bearing or shear without subjecting the welds to bending. A list of some of the claims made by welding exponents follows: economy of metal by the absence of rivet holes in vulnerable parts, simplicity and minimum weight of connection details, elimination of shop costs, direct shipment from mill to site, and in some localities noiseless erection is an item.

Where steel piles are used, welding provides an easy means of connection of sway bracing as it corrects misalignment of piles due to driving conditions, and in the steel rail, adjustments are likewise simple. On this work an innovation was the use of cross

bridging of angles in place of heavy, solid diaphragms, not only effecting a reduction in weight, but permitting a more efficient disposal of these stiffening members. Connections were so designed that overhead welding, a particularly difficult operation, was eliminated. A further reduction in costs was effected by using the gas flame for cutting steel in place of expensive machine sawing.

SPECIAL SPECIFICATIONS

It was necessary to write complete special provisions covering electric welding, which meanwhile have been incorporated in our standard specifications. These special provisions cover equipment, supplies, fabrication and personnel. As to the latter, the test work is of considerable importance. Pre-qualification of welders on State work is determined by machine testing specimens of the various types of welds as submitted by the prospective welders. At stated intervals the crew is subjected to the same tests.

The total contract was approximately \$102,000, the lowest of sixteen bids which ranged to \$120,000.

Surveys Reveal Abnormal Records

(Continued from page 30)

throughout the year and six are regular drainage stations. The sampling at other than permanent stations will be discontinued shortly when the salinity has reached the minimum.

CALIFORNIA COOPERATIVE SNOW SURVEYS

The work under this project during the past month has been principally in the office in bringing up to date all compilations of stream flow and precipitation data. In accordance with the established program, it was planned that the first regular surveys at the 50 or more key courses throughout the State should be made in the latter part of January and the season's first bulletin of snow survey and precipitation data sent out early in February. As a result, however, of the abnormal precipitation and snowfall in the latter part of December, earlier surveys in the first part of January were made at a few of the snow courses and a bulletin was prepared to present for selected stations throughout the State, the available snow on ground and precipitation data to January 1st as obtained chiefly from the records for U. S. Weather Bureau stations.

In so far as generalizations for entire stream basins and state-wide territory could be made from the limited stations for which data were available, the precipitation to January 1st was indicated to be from 50 to 60 per cent *above normal* from the Upper Sacramento Basin south through the Mokelumne Basin, and from 80 to 100 per cent above normal from the Tuolumne to the Kern Basin, with a general average of 70 per cent above normal from Upper Sacramento to Kern Basin. In the Los Angeles, San Gabriel and Santa Ana Basins, the indicated general average was around 110 per cent above normal.

The records of the amount of snow on the ground at the end of December revealed that with few exceptions, the pack at the end of December, 1931, was the greatest, for that date, of all years of record. Unfortunately the period of record for many of the stations is comparatively short. The following gives the data for some of the higher elevation stations:

		Snow on Ground at the end of December—Inches		
Station	Drainage Basin	1931	Previous Maximum and Year	Period of Record
Canyon Dam	Feather	45	33 (1914)	17
Norden (Donner Summit)	Yuba	168	100 (1922)	34
Lake Spaulding	Yuba	56	39 (1916)	20
Twin Lakes	American	98	96 (1922)	11
Huntington Lake	San Joaquin	82	51 (1921)	17
General Grant Park	San Joaquin	92	26 (1928)	7
Giant Forest	Kaweah	66	54 (1922)	11

WATER RESOURCES

a. Mojave River and South Coastal Basin Investigations.

The Mojave River Investigation and South Coastal Basin Investigation have proceeded in a routine way.

Work in preparation for a report on well measurements in South Coastal Basin is almost completed.

b. Ventura County Investigation.

The drilling program on Piru Creek was discontinued in the early part of November because of lack of funds. This work will be resumed when funds are made available in the coming year.

c. Salinas Valley Investigation.

The Salinas Valley Investigation proceeded in a routine way. Very large floods were recorded in the Salinas Valley.

d. Pit River Investigation (Modoc and Lassen Counties).

The report covering the three years investigation, October 1, 1928, to October 1, 1931, is approximately 75 per cent complete.

e. Santa Clara Investigation.

All wells of this investigation were measured between December 1st and December 25th and the heavy rains which occurred during the month have given an opportunity to obtain data with respect to percolation losses which will go to build up the ground water plane and terminal waste on Stevens, San Antonio, Permanente, Campbell, Penetencia, Los Gatos, and Guadalupe creeks. Measurements were made on each creek at high and low stages and staff readings were taken in order to interpolate and estimate total discharges. Measurements were also made on Kirk and Duncan ditches and percolation tests were made on Alamitos and Guadalupe creeks.

f. Napa Valley Investigation.

Stream gagings were made during December on Napa River and Conn, Rector and Dry creeks and the regular monthly reading of wells was made.

STATE WATER PLAN

The California Water Resources Commission held a series of meetings on January 14, 15 and 16 in the State Building, Civic Center, San Francisco. On January 14th the Commission reviewed the financial phases of the Great Central Valley Project of the State Water Plan. On January 15th the Commission met jointly with the Legislative Water Committee in the forenoon, at which time consideration was given to the tentative form of a constitutional amendment proposed for submission to the people of California, authorizing the State Water Plan and providing machinery for its orderly execution. January 16th, the Legislative Water Committee and the California Water Resources Commission met in executive session to consider tentative recommendations made by the Committee and Commission in connection with the proposed constitutional amendment. The Water Resources Commission met in San Francisco on January 21st to further discuss the form of a constitutional amendment for consideration by the Legislature and submission to the vote of the people.

Many New Paving Devices Developed

(Continued from page 10)

In localities where rapid surface drying exists, the slab is kept continually moist by fogging. This fogging is often practiced along with the finishing and floated into the surface. Tests made with a surface hardness determining device developed by the U. S. Bureau of Public Roads show that this surface retempering does not decrease the surface hardness, and in some instances it shows an increase in strength over the normal curing methods.

Fogging has practically eliminated hair checking. During the past season a seven mile project was completed in Imperial Valley by the fogging method and without any hair checking, which previously had been considered an impossibility. Under the fogging method the slab is kept continually moist while uncovered, and, after finishing is completed, it is covered with burlap and kept wet until ponded or covered with an earth blanket.

The present mixture design consists of taking all the fine aggregate available for the individual project, making up mixtures of the individual fines and in combinations, and likewise in combinations with commercial fillers, and selecting the most desirable combination on the basis of stability results obtained in the Testing Laboratory. The idea is to carry as much asphalt in the mixture as the stability test results will permit. Our tests indicate that the most satisfactory film thickness or surface coating of asphalt is not the same for any two different aggregates, and varies considerably.

FILLER RESULTS

The results obtained with our high dust content mixtures warrant the continuation of the present practice. In these surface mixtures, commercial limestone dust filler constitutes 22-25 per cent of the total mixture passing the 10-mesh sieve. We have used, to a limited extent, a substitute filler of diatomaceous earth, with good results, the latter being proportioned in the mix volume for volume with its equivalent of limestone dust. Substitute fillers are accepted only on the basis of stabilities equivalent to that produced with limestone dust.

The high dust content mixture is much less susceptible to pushing and rolling than former mixes, and, considering the increased traffic the latest work has been immediately subjected to, this is a very satisfactory result. The recent mixtures also retain their nonskid qualities a much greater length of time than did the former work. Our oldest pavement of this type has now served 4½ years, and other than the narrow strip in each traffic lane where car drippings collect, the pavement is as nonskid as the day it was built.

PRODUCTION IMPROVED

Production plants have been materially improved in the last few years. Capacity of mixers has been increased to as high as three tons. Improved methods of feeding and storage capacity of heated aggregate have been developed to keep these plants operating at maximum capacity. Mixer gates have been so perfected that a batch may be discharged in a very few seconds and all lost time has been cut to a minimum. Timing devices have been installed on 50 per cent of the plants operating during the past year.

On one project an entirely automatic proportioning device was used. This device, operated by hydraulic jacks powered by electric motors, opens one gate and holds it open until the set weight is deposited in the weight box, then closes the first gate and opens the second gate in the order predetermined. Four separate mixes may be set up at one time and the change from one mix to another is instantaneous by means of a selective switch. The rotation of pull on the bins can be set in any way desired. This project averaged 953 tons per 8-hour day for every day the plant started over a 44-day period, the size of batch being 2½ tons.

Spreader boxes are universally used to distribute the truck loads of mixture. The finishing machine has been quite generally adopted, and various improvements have been made upon it from time to time since its inception several years ago. A traveling track arrangement has been perfected that drags along under the screed and eliminates the necessity of carrying track ahead.

CATERPILLAR MACHINE

One machine has been constructed in California that operates on a caterpillar tread running just outside the side forms, the screeds riding on the side forms as in the other models. This design has many advantages over previous machines. The rake design has been improved by changing the motion to a direct fore and aft movement which gives a combing action to the mix.

Greater smoothness of finished surface is being obtained by substituting a direct cross-roll with the first tandem roller behind the 3-wheeler on initial compression in place of the former practice of diagonal or half circle rolling. In this cross-roll every square foot of the pavement is covered, and if the shoulder width permits, all turning of the roller is done off the pavement. The smoothness of asphaltic surfaces now approximates that obtained on our portland cement concrete pavements.

The foregoing improvements in methods and results have been accomplished by the hearty cooperation of contractors, equipment manufacturers, and highway engineers working with the thought ever in mind to better the pavement output, both as to quality and quantity per dollar invested.

Forest Road Work

Road work in the national forests of California progressed more rapidly in the fiscal year 1931 than in any previous year, according to a statement by Regional Forester S. B. Show. A total of approximately \$3,000,000 was available for construction and improvement of roads and trails in national forests in California—the largest amount in any previous fiscal year.

In the forest highway system there are now 80 projects with a total length of 2300 miles. About half of this mileage has been improved to a satisfactory standard. The total mileage of the minor road system in the national forests is 20,000 of which about 15,000 miles has been improved.

Gleaned From the Mail Bag

National Park Executive Commends Work of Safeguarding Roads After Floods

From F. A. Kittredge, Chief Engineer, National Park Service, San Francisco: Soon after the floods of the latter part of December I had occasion to drive over your highways from Palo Alto to Yosemite via Pacheco Pass, Merced and El Portal.

I intended to write you at once but neglected to do so, telling you how completely your various organizations had safeguarded washouts, slides and all dangerous places.

There were lanterns, light-bombs, barricades and signs so correctly and generously placed that there could be little opportunity for even the most careless of tourists to overlook the dangerous places in the road.

* * *

HELPED RESTORE SERVICE

From Ben Brown, Division Plant Manager, Pacific Telephone and Telegraph Company: It is with a sincere feeling of gratitude and appreciation that I learn from our field forces who were engaged in the restoration of service in the snowbound mountain area during the recent heavy storms of the cooperation and courtesies extended to our people by employees of District III located at Colfax, Summit and Truckee.

We realize the difficulties and hardships to be encountered during such periods of extreme emergency, and our definite responsibility in maintaining through service on important channels of communication under the most trying conditions.

I particularly desire to call attention to those men in your organization, Messrs. J. W. Vickrey, C. H. Weeks, L. D. Craig, and C. H. Bohrmann, who displayed such a fine spirit of cooperation in this emergency, and will appreciate it if you will convey to them my sentiments.

* * *

SNOW REMOVAL APPRECIATED

From A. L. Nevins, Twain Harte Realty Company: We take this opportunity in expressing our appreciation of the wonderful results that the State Highway Department has rendered on the Sonora-Mono Highway.

Commencing in November and December, 1931, we have had considerable snow, and the traveling public has used every means to arrive in the snow area.

It has been our pleasure to note that the State Highway Department is doing everything in their power to maintain the Sonora-Mono Highway in the best possible condition for the traveling public.

* * *

From W. G. Hagelstein, Mayor of Dorris: I take this opportunity of expressing to you the thanks of our town and community for your efforts in keeping the Weed-Klamath Falls highway open this winter.

State Park Chief Reports Splendid Cooperation in Keeping Highways in Repair

From Colonel Charles B. Wing, Chief, Division of State Parks: I thought you might be interested in the item that follows, which is a part of the weekly report of Mr. Foster, who is acting as district superintendent of this area:

"As noted from the Warden's reports, it is surprising the number of cars and people who visit that park (Mt. Diablo State Park) during the periods that the mountain is snow-capped. The traveling of the roads at such periods certainly does not help them any, so that it is particularly pleasing to find how quickly the Highway Department, under Mr. W. F. Holbrook, District Superintendent, is following up and making repairs. They certainly are doing good work at Diablo State Park."

The above thoroughly illustrates the splendid cooperation we are receiving from your department throughout the whole State Park System.

* * *

NO SMALL TASK

From E. H. Brouillard, Secretary Susanville Rotary Club: At a meeting of the Rotary Club of Susanville held on the 23d instant, I, as secretary of the club was instructed to write you expressing the appreciation of the members of the club and of the people of Susanville generally, for the good work which has been done by Mr. E. J. Gribble and his coworkers, in keeping the eastern end of the Susanville-Red Bluff highway open for travel during the recent storms.

The task performed by them was no small one and commands the admiration of all who are familiar with conditions.

* * *

SAFETY ASSURED

From G. P. Blythe, Burlingame: Recently I drove from San Francisco to Agua Caliente and back to San Francisco during the heavy rains. I wish to compliment your department and those who had charge of the highways at that time for the exceptional care that was taken to insure the safety of the traveling public and to facilitate the exceptionally heavy travel occurring during the holiday week.

* * *

THANKS FROM AMERICAN LEGION

From Andrew H. Stahl, Adjutant, Melvin Smyth Post 58: Melvin Smyth Post 58, American Legion, wish to thank the Department of Public Works for the wonderful cooperation toward making the snow carnival at Longbarn, California, January 17, 1932, such a success. Especially do we wish to thank S. E. Harris and his men who worked so diligently.

Bridge Piles Tested for Safety With 500 Tons of Steel Rails

(Continued from page 23)

design for a continuous suspension type structure. For the East Bay Crossing the designs under consideration have been narrowed down to the cantilever or arch suspension type.

Ten cars of steel rails, weighing 500 tons, were utilized in an interesting test conducted this month by the Bay Bridge engineering staff for the purpose of determining the load that may be safely put on one pile.

INTERESTING TEST

The test was made on nine piles driven 110 feet into the clay found at the bottom of the Bay midway between Yerba Buena Island and the Key Route Mole. After being driven into the bay bottom, the piles were loaded with the steel rails to provide a load of 57 tons per pile. The test showed a settlement, according to Chief Engineer Purcell's report, of less than 3-4 inch per pile.

In the final design for the pier to be located at this point, 480 piles will be driven. Each pile will be subjected to a load of one-half the intensity under the present test, and will be driven 30 feet deeper into the clay than the test piles.

Boring operations have started on the site of the first pier off San Francisco. After these borings are complete the drilling will be shifted to the center anchorage. An additional hole will also be bored at Pier 5, which will complete the bay borings.

SNOW MAY BE RED

What color is snow? White is the natural answer, which may be right or wrong, as the case may be. Snow is generally white, so white that it has become a synonym for exceptional purity. But snow may also be red—blood red, as Judge Walter Fry recalls having seen it on one or two occasions in the Sequoia National Park. U. S. Department of Agriculture chemists found it due to a minute form of life of the genus *Sphaerella*.

FEWER CARS, MORE MILEAGE

Motorists throughout the country averaged 300 miles more of travel per car last year than in 1930, it is revealed in preliminary figures reaching the California State Automobile Association. This conclusion is based on the gasoline consumption for motor cars, which was 500,000,000 gallons above the preceding year.

This showing was made in the face of a reduction of 1,000,000 cars in the production for 1931.

SOME RIDE!



ALL WORK and no play makes a dull day, so these highway workers managed to snatch a little fun at the noon hour by grace of the shovel operator.

Introducing "Pretzel" Intersection Plan

Among traffic relief schemes being developed in New Jersey and some other heavy travel centers, is the "four-leaf clover" or "pretzel" type of boulevard intersection. This consists of separated cross-roads, one bridged across the other, with connecting road links joining each of the four sides of the two main routes.

This plan, it is pointed out by the engineering department of the Automobile Club of Southern California, eliminates the necessity of cars crossing the path of others at any time, regardless of the turn or direction each may wish to take. Motorists desiring to turn left from the one boulevard into the other, will continue under or over the bridged intersection, then turn to the right just beyond the bridge into the connecting link road, making a loop, and turning right again in order to continue in the direction planned on the main cross-road. Thus two right turns make a left turn, without having to cross the path of other traffic.

Highway Bids and Contract Awards Made in January

MERCED COUNTY—One mile east of San Joaquin River to easterly boundary, 0.1 mile to be graded and paved with Portland cement concrete, and 3.5 miles levees to be constructed. Dist. VI, Rt. 32, Sec. C, C. W. Wood, Stockton, \$12,232; Granite Construction Company, Ltd., Watsonville, \$13,281; W. A. Dontanville, Salinas, \$13,051; Fred W. Nighbert, Bakersfield, \$14,470; Valley Paving and Construction Co., Fresno, \$17,727; Thermotite Construction, Inc., San Jose, \$12,190; Force Construction Co., Piedmont, \$12,382; Tieslau Bros., Berkeley, \$13,746. Contract awarded to Delta Dredging Co., Pittsburg, California, \$11,604.

MENDOCINO COUNTY—Bridge across Russian River 3.5 miles northeast of Ukiah, consisting of one 100-foot steel span, fourteen 19-foot timber spans and .3 mile of roadway to be graded and surfaced. Dist. IV, Rt. 15, Sec. A, The Utah Construction Co., San Francisco, \$35,213; M. B. McGowan, Inc., San Francisco, \$33,660; Fred J. Maurer & Son, Inc., Eureka, \$35,331; Healy-Tibbitts Construction Co., San Francisco, \$34,642; A. W. Kitchen, San Francisco, \$34,320; W. J. O'Neil, San Francisco, \$41,055; A. T. Howe, Santa Rosa, \$38,963; J. W. Terrell, Sacramento, \$33,295; Smith Bros. Company, Eureka, \$33,344; Peter McHugh, San Francisco, \$33,506; C. W. Wood, Stockton, \$38,060; Rocca & Calletti, San Rafael, \$36,625; M. R. Peterson, Sacramento, \$33,349. Contract awarded to Helwig Construction Co., Sebastopol, \$32,359.

MONTEREY COUNTY—Construction of Salinas Maintenance Station, 1 mile north of Salinas. Dist. V, Rt. 2, Sec. A, Empire Construction Co., Ltd., San Francisco, \$17,750; J. C. Thornburg, Spreckels, \$13,562; John E. Branagh, Piedmont, \$14,353; Thermotite Construction, Inc., San Jose, \$12,407; Oliver S. Almlie, San Francisco, \$13,353. Contract awarded to Theodor Johanns, San Francisco, \$12,176.

PLACER COUNTY—Between Gold Run and Airport, about 11.5 miles to be graded. Dist. III, Rt. 37, Secs. C, D and E, Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$517,988; Healy-Tibbitts Construction Co., and J. P. Holland, Inc., San Francisco, \$486,143; Granfield, Farrar & Carlin, San Francisco, \$403,822; The Utah Construction Co., San Francisco, \$536,039; Lewis Construction Co., Los Angeles, \$419,034; Contoules Construction Co., and Schuler & McDonald, Inc., Oakland, \$477,916; T. E. Connolly, San Francisco, \$659,922; Clyde W. Wood, Stockton, \$438,042; von der Hellen & Pierson, Castaic, \$449,458; Hemstreet & Bell, Marysville, \$432,249; E. C. Coats, Sacramento, \$532,159; George Pollock Co., Sacramento, \$501,735; Skeels & Graham Co., Roseville, \$451,928; Morrison-Knudsen Co., Boise, Idaho, \$498,777. Contract awarded to Lang Transportation Co., Los Angeles, \$358,419.

SAN DIEGO COUNTY—Between Carlsbad and Oceanside, about 0.3 mile of highway embankment to be widened. Dist. VII, Rt. 2, Sec. B, H. E. Cox & Son, Pasadena, \$5,296; Yglesias Bros., Inc., San Diego, \$5,800; Match Bros., Elsinore, \$6,305; Daley Corporation, San Diego, \$18,788. Contract awarded to H. H. Peterson, San Diego, \$3,783.

SAN DIEGO AND IMPERIAL COUNTIES—Between Tecate Divide and Mountain Springs Grade, 14.6 miles to be graded and paved with Portland cement concrete. Dist. VII, Rt. 12, Secs. G, H, Basich Bros. and Gist & Bell, Torrance, \$339,420; E. Paul Ford, San Diego, \$335,888; Walter Trepte & C. R. Butterfield, San Diego, \$369,382; Daley Corporation, San Diego, \$313,425. Contract awarded to Match Bros., Elsinore, \$259,865.

SAN LUIS OBISPO COUNTY—Erection and completion of Maintenance Station about 2 miles north of Cambria. Dist. V, Rt. 56, Sec. B, Roland L. Hautz, Cambria, \$9,650; Theodor Johanns, San Francisco, \$9,788; Oliver S. Almlie, San Francisco, \$9,870; Jones & Turner, Santa Maria, \$9,966; W. J. Smith, San Luis Obispo, \$10,087; Theodore M. Maino, San Luis Obispo, \$10,328; Geo. B. Finch, Atascadero, \$10,592; Earl Bowen, Strathmore, \$10,784; Chas. W. Fairbanks, San Luis Obispo, \$10,850; Thermotite Construction, Inc., San Jose, \$11,112; Edwin D. Jarvis, San Luis Obispo, \$11,800. Contract awarded to Daniels Bros., Cambria, \$8,990.

In Memoriam

JAMES F. ELWOOD, Draftsman in the District VII office of the Division of Highways, died December 21, 1931, of heart disease in Los Angeles.

Mr. Elwood was one of the oldest employees of the District in service, having been employed almost continuously since May 15, 1912.

He was born in England and came to this country in 1901, taking a position as office engineer with the Santa Fe Railroad Company. He was employed by that company and by the Los Angeles & Salt Lake Railroad Company until 1912, when he resigned to take a position with the California Highway Commission.

Mr. Elwood was an exceptionally conscientious and efficient worker during his long period of employment with the California Highway Commission and the State Division of Highways.

He is survived by a widow, Sarah F. Elwood, and a son, Ernest Elwood, who reside in Los Angeles.

An increased road building program always makes more jobs, adds more to general wealth and increases more economic transportation for more people than any other industry.—*American Highways*.

The big surprise of the month was undoubtedly experienced by the Austin owner who drove into the Third Street tunnel in Los Angeles and came out of a gopher hole in Whittier.—*Exchange*.

Then there is the city kid who went to the country to see his grandmother for a visit and saw some ducks walking around and shouted, "Oh, granny, lookit the birds that just got out of a rumble seat!"

ARCHITECTURAL AWARDS

For Month of January

Pacific Colony—Contract for ground lighting to Walker-Martin Corp., Los Angeles, \$6,430.

Stockton State Hospital—Contract for installations of dumbwaiters to Building Specialties Company, San Francisco, \$7,300.

San Jose State Teachers College—Natural Sciences Building—Contract for General Work to J. F. Shepherd, Stockton, \$139,356; Complete Plumbing, Heating and Ventilating work to A. J. Peters & Son, San Jose, \$35,902; Electrical work to Eddy Electric Co., Stockton, \$10,506.

Napa State Hospital—Addition and Alterations to Female Acute Disturbed Cottage and Addition to Acute Quiet Hospital—Contract for General Work to Barrett & Hilt, San Francisco, \$52,550; Plumbing work to J. A. Fazio, Oakland, \$4,150; Heating Work to Schreiber Bros., Oakland, \$2,479; Electrical work to W. B. Baker & Co., San Francisco, \$1,244.

Preston School of Industry, Ione—Dairy Unit and Farm Foreman's Cottage—Contract for General Work to Harry Schuster & Co., Ltd., Oakland, \$23,905; Complete Plumbing and Heating to Carl T. Doell Co., Oakland, \$8,600; for Electrical work to Jack W. Thomas, Sacramento, \$1,650; Insulation work to Allyn L. Burr Co., Sacramento, \$1,860; Refrigeration to Carrier Engineering Corp., San Francisco, \$2,636.

Pacific Colony—Three Dormitory Buildings—Contract for General Work to Herbert M. Baruch Corp., Los Angeles, \$74,163; for Electrical work to H. H. Walker, Los Angeles, \$2,375; for Heating and Ventilating work to J. B. Welsh, Alhambra, \$10,400; for Plumbing work to F. B. Jones, Pasadena, \$7,785.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

COLONEL WALTER E. GARRISON-----Director

JAMES I. HERZ-----Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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T. E. STANTON, Materials and Research Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding

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J. H. SKEGGS, District IV, San Francisco

L. H. GIBSON, District V, San Luis Obispo

E. E. WALLACE, District VI, Fresno

S. V. CORTELYOU, District VII, Los Angeles

E. Q. SULLIVAN, District VIII, San Bernardino

F. G. SOMNER, District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

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HAROLD CONKLING, Deputy in Charge Water Rights

A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

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J. W. DUTTON, General Superintendent Construction

W. H. ROCKINGHAM, Mechanical Engineer

C. A. HENDERLONG, Assistant Mechanical Engineer

W. M. CALLAHAN, Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

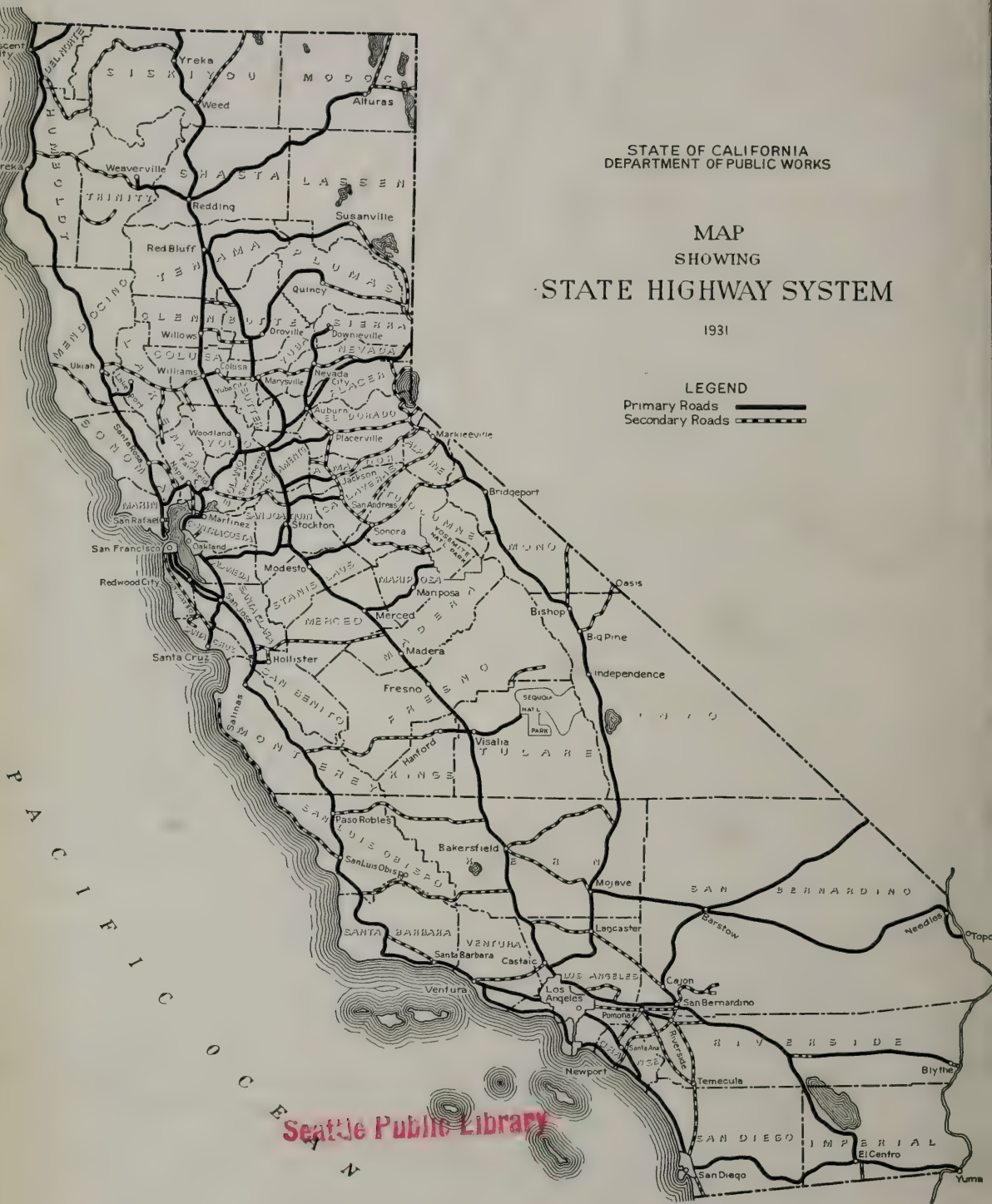
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND
Primary Roads 
Secondary Roads 

Seattle Public Library

Mar 1932

CALIFORNIA HIGHWAYS and PUBLIC WORKS

MARCH
1932

Official Journal of the
DEPARTMENT OF PUBLIC WORKS

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California Scores High Among States for Economy of Road Expenditures

Sixth in Population and Second in Registrations,
State is 37th in Highway Costs per Capita
and 47th in Cost per Car for 1931

FORTY-EIGHT states constructed nearly 50,000 miles of State roads during 1931 at a cost of \$1,038,090,101.

The state of New York spent \$75,744,000 on state highways during 1931, and Illinois was second with expenditures amounting to \$54,000,000.

How about California?

The American Association of State Highway Officials has compiled figures on State highway construction in all of the forty-eight states for 1931 and a comparative tabulation of their findings was published in the January issue of American Highways, the association's official quarterly publication, for the current year.

REVEALING FIGURES

A study of this tabulation reveals that, proceeding under its orderly Ten Year Plan for the addition of highways, California—pioneer in highway development, a leader in high standards of construction, sixth among the states in population, but second in area and motor vehicle registrations—is twenty-third in total mileage of State highways constructed in 1931; thirty-seventh in per capita cost to its populace for all State highway improvements during the year and forty-seventh, or next to the lowest State in the Union, in the expenditure rate per registered car.

Nearly one-half of the forty-eight states built more mileage of State roads in 1931 than were constructed by California. Minnesota led with a total of 3281 miles, Pennsylvania followed with 3022, and the mileage of other states tapered from these, with California at 807 miles.

In the placing of high type pavement on the State highway systems, New York was out in front with 960 miles of paving for the year and Louisiana's 900 miles placed the Creole State in second place. California ranked 20th with 218 miles of pavement.

In the placing of bituminous treated crushed rock surfacing California was ex-

ceeded by ten states. But though our 408 miles of treated surfacing placed California in eleventh position, it should be noted that Pennsylvania, the leading State in this phase of highway construction, laid over five times as much bitumen bound surfacing, with a total of 2146 miles.

For bridges built on the State road systems California is well up in the running, being third in the number constructed and eighth in expenditures for this department of construction. Our State built 207 bridges at a total cost of \$3,217,000. Only New York, with 514 and Missouri with 410 built a greater number and of the seven states with higher expenditures Indiana led with \$15,000,000 and New York was second with \$7,500,000. A comparison of numbers of bridges does not mean a great deal, as a bridge may be 20 feet long or many thousand feet, but the expenditures for major structures on a State road system are barometers of progress in modernization.

TENTH IN TOTAL

In comparative total expenditures on all types of highway construction, California ranks tenth with a total of \$38,073,273 expended during 1931. The Empire State in the lead with \$75,744,000 was followed by Illinois with \$54,000,000, Pennsylvania with \$52,500,000, New Jersey, \$48,000,000; Michigan, \$46,500,000; Texas, \$42,163,806; Minnesota, \$40,752,564; Louisiana, \$40,000,000; Iowa, \$39,902,000; California, \$38,073,273; Missouri, \$31,920,238; and South Carolina, \$31,000,878.

In the case of Pennsylvania, that State took over 20,000 miles of county roads and is engaged in improving them with an inexpensive type of oil surfacing which makes its mileage of 3022 show a cost per mile lower than other states putting in a higher standard modern surface.

It is readily noticed from the facts recited that California with its vast area, large population, and high position in automobile regis-

15 1932

New Scenic Shasta Gorge Highway Boasts 5 Major Bridges in 4.5 Miles

By F. W. HASELWOOD, District Engineer

ONE of the outstanding scenic road improvements recently completed and opened to traffic by the Highway Division of the Department of Public Works is the relocation of the Shasta River Canyon Highway, an important link of the Pacific Highway section of U. S. 99 between Yreka and the Klamath River. To attain modern highway standards, this project involved lifting the route from a tortuous water-level course following bends of the river to a new alignment high up on the slopes.

The accomplishment of this objective entailed many interesting engineering features and problems including the construction of five major bridges within a distance of 4.5 miles, making Shasta Canyon the most

The formation through the Shasta Canyon is principally rock. It is seamed and broken and difficult to excavate to well defined lines. The country is precipitous and steep and the location lies along the slopes of the canyon, well above the streambed, passing through many formidable bluffs and rocky slopes.

Considerable difficulty was encountered in the construction work. Due to inaccessibility it was necessary in a number of instances to build temporary roads extending from the existing highway to the new road to get shovels and other equipment and supplies into the work.

In some instances stockpiles of aggregate and cement, form lumber, steel and concrete, were placed at locations accessible to



Diagram Map Showing Relocation of Shasta River Canyon Highway

thickly bridged section of any part of the California highway system.

The necessity for this improvement, in addition to meeting the demands of traffic with a modern, shorter and more direct highway, was made imperative by the constantly increasing number of accidents on the dangerous old road.

This old roadbed had a width of 16 feet with a minimum radius curvature of 50 feet and a maximum gradient of 7 per cent. There were three narrow bridges crossing the Shasta River and one over the Klamath River. The original work was to a very low standard of alignment entirely obsolete at the present time, even for secondary roads. The grade line for the most part was easy with only a few stretches of 6 and 7 per cent. Some adverse grade was included in order to avoid expensive construction through several heavy rock bluffs.

the existing road and transported across the canyon by means of cableways.

The reconstruction project extends from a point 1.5 miles north of Yreka through the Shasta Canyon, terminating a short distance above the Klamath River Bridge. About 95 per cent of the entire project lies in the Shasta and Klamath canyons on Route 3, Pacific Highway, the remainder being the connections it was necessary to build to properly join the new alignment and grade to Route 46, Klamath River Lateral, extending down the Klamath River to the coast. The actual length of reconstruction on Route 3 is 7.19 miles as compared with 9.37 miles on the old road.

RAISED 350 FEET

The new construction reaches an elevation at its highest point of approximately 350 feet above the streambed of the Shasta River.

(Continued on page 42)



Shasta River Bridge
near mouth of Shasta River
8 miles north of Yreka



Dry Gulch Bridge
5 1/2 miles north of
Yreka.



Shasta Bridge No. 2
300 feet above canyon
floor - 200 feet
long - 6 miles
north of Yreka.

Crossing No. 3 of Shasta
River about 7 1/2 miles north
of Yreka, Siskiyou Co.



Shasta Bridge No. 1
3 1/2 miles north of Yreka



Army Report Recommends \$11,370,000 U. S. Contribution to State Water Plan

By A. D. EDMONSTON, Deputy State Engineer

IMPORTANT developments in the solution of California's Water Problem have occurred during the past month.

The Federal Government's interest in the state-wide plan of water conservation is evidenced by a telegram received by Colonel Walter E. Garrison, State Director of Public Works, from United States Senator Hiram W. Johnson. The Senator stated that an appropriation of \$20,000 for investigation of the project had been approved by the Senate Committee on Irrigation and Reclamation and placed upon the Senate calendar for final action.

If passed by the Senate, a subcommittee of the Irrigation and Reclamation Committee will inspect conditions in California next summer in order to secure first hand information on the water question.

Last summer an important subcommittee of the House of Representatives Appropriations Committee spent twelve days in studying the water needs and local conditions, visiting the key points and consulting with interested people. The delegation was escorted throughout the State by State officials and was received by Governor Rolph in Sacramento. The members of the party were greatly impressed with the merits of the program and of the necessity for prompt action. They stated that any overture from California would be given a most sympathetic reception by them.

To Inform Congress

The scheduling of visits of these committees are some of the results accomplished by Governor Rolph's Water Conservation Committee, which went to Washington, D. C., in February, 1931. This committee, as part of its special mission, was to arrange for Congressional committees to visit California and become acquainted with the water conditions in this State. In its report to Governor Rolph, the committee stated: "The executive departments are well informed and are sympathetic to Federal cooperation on the California Water Plan. Congress, on the other hand, is not informed and much educational work will be necessary."

The advantages gained by having these Congressional committees personally study and investigate the need for water conservation here are self-evident. Should the State at any time go to Congress to request Federal cooperation, the members of these important committees will have a complete picture of the entire project and will be able to readily determine the degree to which the United States Government should participate in the project.

On March 14, 1932, Colonel Thomas M. Robins, Division Engineer for the Pacific Division, War Department, announced that the final report on the

Great Central Valley project had been made. He stated:

Favorable Report

"If the State and/or other responsible local interests will construct the proposed Kennett Reservoir and operate it so as to reduce high water flows on the Sacramento River and to maintain a low water flow of not less than 6000 second-feet between Chico Landing and Sacramento, the report finds that a Federal contribution of about \$7,370,000 to the first cost of the reservoir will be justified in the interest of navigation and flood control.

The report also finds that, in the interest of navigation, the proposed transfer of water by pumping from the Sacramento Valley southward should be required to be made through a series of navigable pools in the San Joaquin River between Stockton and Mendota, with suitable locks installed at the dams forming these pools. If this is done the United States will be warranted in contributing about \$4,000,000 to the first cost of the locks and dams and in assuming their maintenance and operation."

This important report will be considered by the Board of Engineers for Rivers and Harbors, and reported on by it to the Chief of Engineers, U. S. Army. The Chief of Engineers will transmit the report with his recommendations to Secretary of War who in turn will transmit it to Congress.

Amendment Drafted

Both the Governor's Water Commission and the Joint Legislative Water Committee have been actively working on a draft of a proposed constitutional amendment. The legislative committee has adopted a draft of an amendment designed

as an enabling act to permit the State to embark upon a state-wide program of water conservation, and is preparing a report to the Governor.

Two important provisions are proposed in the draft to the committee. First, that all indebtedness incurred by the State on any water conservation project would be authorized by a vote of the people, and second, that the entire plan would be based upon a payback principle, whereby the State must have firm contracts for the repayment of all indebtedness incurred, before any construction work would be started. Repayment would be further safeguarded by the provision that any district or area contracting with the State for service would be subject to an ad valorem tax levied by the State in event of default by the contracting agency.

The Commission still has a few principles under consideration and has not reached its final conclusion



A. D. EDMONSTON



GOVERNOR ROLPH'S COMMISSION officially titled the California Water Resources Commission as it appeared at a joint hearing in southern California with the legislative committee is shown in this photograph. The members are: (front row, left to right) A. B. Tarpey, Vice Chairman Shannon Crandall, Chairman Matt I. Sullivan, James M. Burke, W. B. Matthews. In the rear row (left to right) are Jesse Poundstone, R. C. Harbison, Francis Carr, Major A. M. Barton, State Engineer Edward Hyatt, Jr.



JOINT LEGISLATIVE COMMITTEE members who participated in water hearings in the south are shown above. In the front row, from left to right, are Assemblyman Edward Craig; Assemblyman Chester M. Kline; Senator B. S. Crittenden, chairman; Assemblyman Harold C. Cloudman; Assemblyman Robert L. Patterson. In the back row, left to right are Senator C. C. Baker; Senator Frank W. Mixer; Assemblyman Robert P. Easley; Joe Nolan, sergeant at arms; Assemblyman Frank S. Israel; Senator Andrew P. Schottky.

regarding a draft of a proposal constitutional amendment. The Commission has held three meetings lasting a total of ten days within the past month, and expects to meet again during the early part of April.

Important Bulletin

The Division of Water Resources of the State Department of Public Works announces the release of

Bulletin No. 28, a report on the "Economic Aspects of a Salt Water Barrier below Confluence of Sacramento and San Joaquin Rivers." This is one of the series of reports prepared on the State Water Plan.

The salt water barrier has been proposed for the purpose of damming off and preventing the annual recurring up-stream movement of salt water from the ocean into the channels of upper San Francisco Bay

(Continued on page 16)

Here's a Catechism Covering Many Questions on State Highway System

By **C. C. CARLETON**, Chief, Division of Contracts and Rights of Way

THE California Highway Commission and the Department of Public Works are constantly receiving inquiries from citizens and various organizations as to the make-up of the State Highway System; how it was planned, organized and developed; how the gas tax revenues are applied and used; how new roads are added to the system, and many other similar questions.

To supply this and similar information in a succinct form covering all points on which inquiries have been made, the following questionnaire with answers is published:

Q. How are State Highways created?

A. Only by act of the Legislature or by vote of the People on a proposition submitted to them at a state-wide election.

Q. Has the California Highway Commission, itself, authority to create a State Highway?

A. No. It is limited to determining the engineering location or relocation of a State Highway between the key points or the termini designated by the act of the Legislature or the measure voted by the People.

Q. What is the mileage of the State Highway System of California at the present time?

A. 7,388 miles.

Q. How are the State Highways of California classified?

A. Primary and Secondary.

Q. What governmental agency makes this classification?

A. The Legislature.

Q. What are Primary State Highways?

A. The Legislature of 1927 declared the main trunk State Highways together with county seat, national park and certain interstate State Highway connections, specifically described in Chapter 794, Statutes of 1927, as Primary State Highways. There are 40 Primary State Highway Routes designated by the Legislature.

Q. What are Secondary State Highways?

A. All State Highways now or hereafter included within the State Highway System other than the 40 Primary State Highways are and shall be classified as Secondary State Highways.

Q. What is the principal distinction between Primary and Secondary State Highways?

A. The Primary are considered of greater importance and, therefore, entitled to greater construction expenditures thereon.

Q. How much of the Three-cent Gas Tax in California can be used for new State Highway construction?

A. One cent.

Q. How is this One-cent Gas Tax provided for new State Highway construction divided?

A. 75% thereof goes to Primary State Highways, 22½% thereof to Secondary State Highways and 2½% thereof to meet assessments against the State in the construction of joint county district highways in cooperation with counties under the Joint Highway District Acts.

Q. How are the Primary State Highway moneys redivided?

A. The State is divided into two groups of counties by legislative act. The 45 northern counties compose one group. The 13 southern counties compose the other group.

Each group receives the proportion of the money that the number of miles of Primary State Highways within its own limits bears to the total number of miles of Primary State Highways designated by law.

Thus: the total mileage of Primary State highways fixed by law is 4287.1 miles.

In the 45 northern counties there are 2345.7 miles thereof, or a proportion of 54.7%.

In the 13 southern counties there are 1941.4 miles thereof, or a proportion of 45.3%.

Therefore, the northern group is entitled to 54.7% of the primary road moneys and the southern group 45.3%.

Q. How are the Secondary State Highway moneys divided?

A. The law provides that they shall be divided equally between the two groups of counties, each receiving 50% of the funds.

Q. What new State Highway policy did the Legislature of 1929 adopt?

A. The policy of adding new roads to the State Highway System, only after engineering and economic studies had been duly made by the Cali-



C. C. CARLETON

Procedure to Bring Before Commission

(Continued from preceding page)

fornia Highway Commission and the State Department of Public Works.

Q. Did the 1931 Legislature follow this policy?

A. Strictly. 800 miles of Secondary State Highways were added to the system by the 1931 Legislature upon recommendation of the California Highway Commission and the State Department of Public Works.

No new mileage was added to the Primary State Highway System.

Q. Did the 1931 Legislature adopt the same policy for the attention of the 1933 Legislature?

A. Yes. Senate Concurrent Resolution No. 10 (Statutes of California, 1931, p. 3111) sets forth the requirements of eligibility of roads not now in the State Highway System for addition to the System.

Q. What are these requirements?

A. The Legislature specified that additions to the Secondary State Highway System shall not be recommended to the 1933 Legislature totaling more than 15% of the theretofore existing Secondary State Highway System, said mileage to be added in the ratio of not less than three nor more than four miles in the southern group of counties to one mile in the northern group of counties.

Q. Why is the southern group of counties allowed a greater portion of additions to the Secondary State Highway System than the northern group of counties?

A. Because, while the Secondary State Highway moneys are divided equally between the two groups, the Southern Group as yet has only 1134.3 miles in the Secondary State Highway System to 1957.9 miles for the Northern Group. The Legislature has adopted the policy of equalizing the mileage as soon as it can reasonably be accomplished.

Q. What other conditions did the Legislature of 1931 impose as prerequisites to inclusion of new roads in the Secondary State Highway System?

A. The California Highway Commission and the State Department of Public Works are instructed to study and recommend to the 1933 Legislature Routes not now in the State Highway System which, either by reason of the large volume of State traffic that they are now carrying, or by reason of the relief that they would afford to heavy traffic upon present State Highways, or as highways serving as important interstate links, might properly be included and added to the State Highway System; and in planning the State Highway System to give due consideration to the development of the natural resources of the State and the improvement of agricultural marketing facilities as well as traffic needs.

Q. When is the study of the California Highway Commission to be completed?

A. August 1, 1932.

Q. How are roads brought before the California Highway Commission and the State Department of Public Works for study as to their qualifications for inclusion in the Secondary State Highway System?

A. Either upon the initiative of the State Highway authorities themselves or on Application for such consideration presented by county supervisors, municipal authorities, civic organizations or interested individuals.

Q. What mileage of new Secondary State Highways has the Legislature of 1931 indicated for recommendation to the 1933 Legislature for inclusion in the Secondary State Highway System?

A. 345 miles, with a division of about 259 to 276 miles for the Southern Group of Counties and about 69 to 86 miles to the Northern Group of Counties.

Q. In what form should an Application for the study of any proposed new road be presented by its proponents?

A. A written Application should be addressed to the California Highway Commission and the State Department of Public Works (no printed blanks have been prepared for the purpose) concisely stating the salient facts and factors which the proponents believe bring the proposed new road within the requirements for eligibility for inclusion in the Secondary State Highway System as hereinbefore set forth.

Also, suitable maps should accompany the Application graphically delineating the proposed new road and its relationship to the present State Highway System.

If the proponents desire to present oral arguments, arrangements should be made with the Secretary of the California Highway Commission, Sacramento, California, for a hearing.

Q. What action do the State Highway authorities take if interested in the proposed new road?

A. They instruct the State Highway Engineer to make a study of the engineering, economic and traffic facts and gather essential data in order that the eligibility of the proposed New Road may be determined before they make their final recommendation of roads to be included in the Secondary State Highway System to the 1933 Legislature.

Q. Is the California Highway Commission authorized by law to locate and construct portions of State Highway within municipalities?

A. Yes. An act passed by the 1931 Legislature (Section 365f of the Political Code, Chapter 807,

(Continued on page 18)

Highway Division to Reflectorize Signs at Important Intersections

By T. H. DENNIS, State Maintenance Engineer

LARGE, reflectorized directional signs will shortly be installed by the Division of Highways at several important road intersections on the State highways. This service will gradually be extended to other points as traffic warrants.

The signs will be installed either at the side of the road in advance of the intersection, or at its gore, depending upon the grade of approach and angle of divergence between the two roads. Only two names with directional arrows will be shown on the signs, one for each road.

The letters and arrows, outlined with crystal reflectors, will be white against a black background, thus providing both day and night service. These signs, mounted high enough to clear intervening machines, will, on the darkest night, apprise the motorist some 500 to 700 feet in advance of his turn, thus eliminating the delay and hazard of stopping.

RESULT OF STUDY

The manufacture and installation of these signs by the two automobile clubs marks the conclusion of an interesting study conducted by the Maintenance Department on reflector type signs. It was noted that the directional signs in common use were illegible at any distance beyond 150 feet.

With our present high speed roads, directional signs at important intersections should be legible at distances of from 500 to 700 feet, depending upon the conditions to be met.

Believing that reflector units would provide this legibility, several signs were made up, designed on available data covering the size and spacing of both units and letters.

The results were very unsatisfactory and a search for authentic information on these points proved unavailing.

Early in March, 1931, Assistant Maintenance Engineer C. F. Woodin was assigned the task of experimenting with the various types of reflector units to determine the effect of color and size, effective spacing, reflective range, both distance and angularity, and the composition of an alphabet, as standard sign letters were not suited for use in a reflector type sign to be read beyond 300 feet. The

information reached after a month's study has been embodied in the construction of these signs, and while by no means final, is by reason of the lack of any available data, representative of considerable advancement.

EIGHT CONCLUSIONS

The conclusions reached may be briefly summarized as follows:

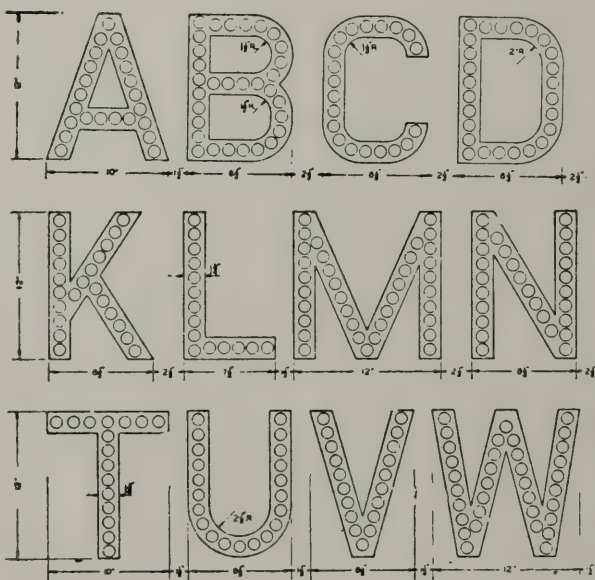
1. Of the four sizes of reflectors tested, the 1-inch size gives best results, with the $\frac{7}{8}$ size very satisfac-

tory. The $\frac{5}{8}$ -inch and $1\frac{1}{8}$ -inch sizes are not adaptable to directional signs.

2. For best results, reflectors should be placed at the minimum spacing.

3. Crystal reflectors reflect light with greater intensity than yellow reflectors.

4. Single lines of reflectors in letters are better than doubles lines because of the greater separation afforded the line of reflectors. For good legibility it is important that the contrast between the reflectors and the background be sharp and clear. Parallel strokes in a given letter should be separated as far as possible within reasonable limits to provide this contrast.



Standard Letters Recommended by Engineers

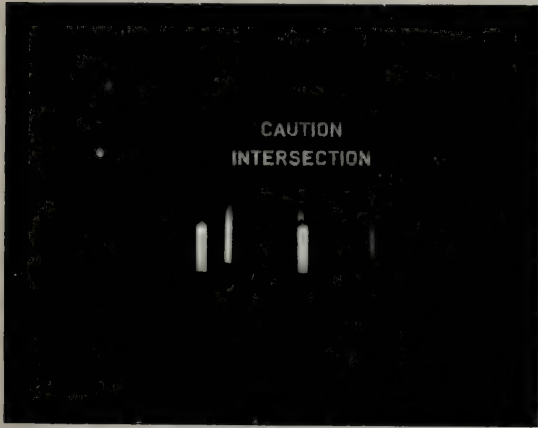
Reflector Study Evolves Better Type

(Continued from preceding page)

5. A 12-inch letter of proper proportions is visible at about 700 feet distance and easily readable at 500 feet. An 18-inch letter of the same proportions is visible at about 800 feet and can be read at 650 feet.

6. Certain types of reflectors have sufficient intensity when 10 feet above the ground as to render a letter legible for as great a distance as when the reflector is located at headlight height, provided the atmospheric conditions are favorable.

7. The spacing between letters for the 12-inch height should be about $2\frac{1}{2}$ inches; and for the 18-inch letters, should be increased to 3 or $3\frac{1}{2}$ inches. Of course adjacent letters shaped to increase the size of the intervening space may have a smaller minimum



AT NIGHT the letters seemingly jump out of the air as car approaches.

interval as prompted by the rules of sign composition.

HEIGHT IMPORTANT

8. The height at which the sign should be placed will be governed by the conditions encountered. Grade, alignment, roadside development and obstructions will all be influencing factors. Sufficient height that the driver of each car may read above another car traveling ahead, is a distinct advantage. Obviously the closer the reflectors are to the direct beams of the headlight, the greater the intensity of the reflection. In the event of unfavorable atmospheric conditions, the reflector of the greatest intensity will give the best service. Signs should



DAYLIGHT appearance of reflectorized warning sign showing method of erection.

therefore be placed as low as possible to give the best visibility. Heights up to 10 feet have been found satisfactory. Before any installation is made, trial reflector letters should be set up in several locations to determine the best location under the conditions encountered.

9. The failure of existing directional signs is due to several causes, namely:

(a) The signs are constructed on enameled metal of high gloss and almost as reflective as the reflector. A dead, nonreflecting background is most desirable.

(b) The letters are too small for legibility at any distance beyond 300 feet.



NO CHANCE to go wrong with this large directional sign glaring out of the darkness.

(Continued on page 29)

How Sacramento Flood Control System Protects Vast Valley Area

Flood waters, like war, are wasteful, wanton, ruthless in destruction of life and property. Engineering science has developed adequate defenses against wild waters that control them and prevent their depredations. Such is the system of weirs and levees, known as the Sacramento Flood Control Project. Not yet completed, it has functioned successfully for some years. The scope and operation of the system is described in the following article:

By R. L. JONES, Deputy Engineer for Flood-Control

THE Sacramento flood control project is designed to secure the orderly control of floods in the Sacramento Valley so that the individual reclamation units may maintain their protective works safely and without destructive competitive construction. The project is cooperative between the land-owners, the State and the Federal government, each bearing approximately one-third of the total cost. Although only about 75 per cent complete, construction of the main units has progressed to such a point that reasonable protection is afforded the greater portion of the valley lands against a flood of 600,000 cubic feet per second.

The outstanding feature of the Sacramento flood control project, and the main principle of design, is the system of by-passes, extending practically its whole length, which carries the surplus water after the level in the leveed river channels has reached what is considered to be the highest safe and economical stage.

The surplus spills into the by-passes over the weirs, of which there are five: Moulton, Colusa, Tisdale, Fremont and Sacramento, the last named three of which are complete, the Moulton weir being now under construction and the Colusa scheduled for completion within a year.

PERMANENT SILLS

These weirs are permanent sills over which the water passes without erosion when a height is reached in the river requiring relief. The Sacramento weir is the only one provided with gates and requiring operation, the action of the others being fixed by the elevations of the crests. The excess water, after passing over the weirs, is carried down through the by-passes which are artificial channels formed

on the natural ground by levees on either side, to discharge into Suisun Bay through the enlarged portion of the lower Sacramento River extending from Cache Slough to Collinsville.

The purpose of holding the water in the leveed river channels to the greatest safe height is to induce scour and removal of mining debris to improve the channels for navigation, and to maintain their flood-carrying capacities.

The by-pass principle has been incorporated in the great plan for flood control on the Mississippi River now under construction by the Federal government.

2000-FOOT STRUCTURE

The Sacramento weir is located on the west side of the Sacramento River at the entrance of the Sacramento by-pass, about three miles upstream from the mouth of the American River, and was completed in 1917 at a cost of \$336,000. In times of flood it will discharge into the Yolo by-pass the excess waters of the Sacramento and American rivers which can not be safely passed in the Sacramento River below Sacramento.

The structure is of concrete 2000 feet in length, upon which are superimposed a concrete highway trestle and a steel girder bridge for the Sacramento Northern Railway. The weir proper consists of 48 waterways 36 feet in width fitted with collapsible gates, each gate being made up of 36 wooden needles, 3 inches by 12 inches, 6 feet long, the lower ends of which are hinged to the concrete sill of the weir. When the gate is closed the needles are in a vertical position, the upper ends forming the crest of the weir at elevation 31.0 feet, U. S. E. D. When the gate is opened the needles fold downstream, lying flat on the

(Continued on page 28)



RAGING FLOOD WATERS are shown rushing through the Sacramento Weir into the Yolo by-pass in the top picture. The scene illustrates the operation of the weir when the gates were opened during the flood period of 1928. It is a 2000 foot concrete structure carrying a highway trestle and steel girder railroad bridge. The weir during normal river stages is pictured immediately below viewed from the by-pass. Lower right picture shows the Tisdale weir. The small picture shows barge fleet maintained for bank protection and emergency work.



Two Highway Relief Camps Prove Success; Benefit Both Men and State

SUPPLEMENTING other activities for the relief of unemployment, the Department of Public Works has carried during the winter an average of 600 men in its two highway work camps. About 250 men have been cared for in Camp Rich (Feather River), and as many as 350 have worked out of Camp "G" at Needles. Most of those at Rich were drawn from the bay district. Those at Needles came from southern California.

The work crews out of these camps have no connection with the three-day maintenance work in which 4400 men have been engaged.

Practically all of the men in the camps were itinerants and unmarried. Fully 90 per cent of them were new arrivals in California.

GOOD RESULTS

The success of the camps has been much better than was expected. There have been two especially agreeable results. The men themselves have behaved well and have assisted the camp officers in maintaining discipline, and they have delivered work in full value for board and lodging in lieu of pay.

An inspector reports: "For strictly hand-work, a surprising amount of yardage has been moved. The men have worked cheerfully and seem to have taken real pride in the progress made. They have worked six hours each working day. The superintendent tells me that if he were starting a contract job, he would be glad to recruit his laborers from the men in camp."

The work of the men at Camp Rich is being done between the north fork of the Feather River and a point about two miles east of Rich. Although the crews did not get on the job until December 15, about 1½ miles of rough grades have been graded to an 8-foot width involving the moving of approximately 25,000 cubic yards of rock and dirt. This included a clearing of the right of way, drilling, blasting, and hauling. All of this has been straight hand excavation.

CONNECTING LINK

The new road is to connect with a similar one being constructed by the prisoners in Camp 23 at Virgilia.

Work at Needles has been in progress on road SBd-58-P. It is more directly in the vicinity of Stations 662, 670, 751, and 773.

About 10,000 cubic yards of excavation have been done to date, and with it considerable grade work that does not so register. The work has included drilling and blasting, and some unusually heavy rock work has been done.

In both camps the sanitation has been especially good. There has been practically no sickness.

It is believed that the work returned to the State will go far in compensating its expenditure.

WELL HOUSED

At Camp Rich the men are housed in the large two-story bunk houses that were constructed for the unemployment relief camp in 1931. There are 32 men in each house. The houses have electric lights and hot water. Community buildings include a large dining room, a clean kitchen, and a camp hospital.

Three good meals are served each day. The menu will compare favorably with that of any first-class construction camp. The housing and feeding has been cared for by the Highway Department, but at Needles the mess service was under contract with a Los Angeles firm.

The southern camp is equally well equipped for service and sanitation. The difference is that the men sleep in army squad tents with side walls and wooden floors. They have army cots and plenty of warm blankets. As a rule there are six men to a tent.

Another agreeable surprise has been in the disposition of the men to cooperate in eliminating trouble makers. A camp officer tells of an incident where a new arrival at his first meal disregarded his knife and fork. He began to eat with his fingers. This was noticed by several of the other men, and one of them called out "Kangaroo Court." The officer says that he took pains not to observe too closely what happened, but that thereafter the man needed his knife and fork.

In addition to the relief they have brought to these detached laborers, the camps have served to ease the unemployment situation in the cities. They were created to meet at



WORKING WITH A WILL for food and lodging, these men of the Rich highway camp for relief of single unemployed itinerants, laboring six hours every working day since December 15, moved 25,000 yards of rock and dirt in widening $1\frac{1}{2}$ miles of Feather River road trail by handwork.



COMFORTABLE QUARTERS were provided in bunkhouses like this at Rich and in tent houses at Needles.



HEAVY ROCK WORK was also done by the men of the Needles camp on southern California roads.



CAMP "G" AT NEEDLES, in San Bernardino County, accommodated as many as 350 men in tent houses arranged as orderly and precise as an army camp.

Highway Construction Season Starts With Advertisement of 21 Projects

THE construction season of the Department of Public Works was ushered in March 1st with the announcement by Col. Walter E. Garrison, Director of Public Works, of a program of projects to be advertised during the month. The program includes 21 separate projects located in 15 counties involving the improvement of 87.5 miles of highway and the construction of seven bridges. The estimated total cost is approximately \$4,000,000.

The following summary and detailed list of projects clearly show the scope of the work:

The grading and surfacing of 8.9 miles between Hat Creek and Fall River Mills in Shasta County involves the relocation of the easterly half of the distance between Canyon Creek, east of Burney, and Fall River Mills. A call for bids for the improvement of the westerly half will be published later in the year, as will be the call for bids for the construction of bridges across the Pit River, Hat Creek and Fall River.

ELIMINATES CURVES

These improvements to this section of the Redding-Alturas lateral will eliminate the existing tortuous road which winds through the lava country over many small summits. The proposed present improvement will connect at Fall River Mills with some 66 miles of recently improved highway.

On the Feather River Highway the large steel arch bridge spanning the river gorge at Pulga is rapidly nearing completion and the project for constructing a graded roadbed from Pulga Crossing to Cresta in Butte County will carry the construction of this new route nearly to the Plumas County line and will involve extremely heavy grading and rock excavation.

The relocation of the section of the Merced-Yosemite lateral in Mariposa County, between Orange Hill school and Mariposa is now under way as far as Pain Flat. The proposed relocation from Pain Flat to Mariposa lies to the north of the existing road and will be built to the standards of modern highway construction so necessary to the safety and convenience of the thousands of tourists who

yearly enter the Yosemite by this route. The new alignment leads directly into Mariposa by the same entrance as the existing highway.

SHORTENS DISTANCE

The State highway which leads into the Sequoia National Park from Visalia is to be constructed on new location from Lemon Cove, 19 miles east of Visalia, to the town of Three Rivers. This relocation covers some 8.5 miles of State road in Tulare County and will eliminate a section of sharp curves and broken grades. The total curvature on the existing routing is 3798 degrees while curvature on the new location amounts to only 534 degrees.

There will be a saving of about 1.1 miles in distance by the relocation, as the highway will be constructed along the Kaweah River from a point about two miles easterly of Lemon Cove to the end of the project. The new construction will consist of a 24-foot roadbed with a bituminous treated surfacing 20 feet wide.

The bridge across Rocky Creek in Monterey County is to be a unit of the Carmel-San Simeon Highway and will be a structure of major proportions. It will be located about 17 miles south of Carmel at the southerly end of a grading contract which is now under way between Rocky Creek and the San Remo Divide. The structure will be a reinforced concrete arch and marks another step towards the completion of this scenic highway which clings to the rugged coast of Monterey and San Luis Obispo counties.

NEW ALIGNMENT

Another improvement to this route is proposed for approximately 10 miles between Cambria and San Simeon on the southerly portion of the road in San Luis Obispo County. The project calls for a relocation of this stretch of highway which will involve straightening the alignment, easing the gradient and providing a 20-foot bituminous treated surface on a 30-foot graded roadbed. The new alignment will be far superior to the existing road in every phase of design and construction; in general it will follow closer to the ocean and will shorten the distance by

(Continued on page 34)

Work Offered for Bids in March

SOUTHERN COUNTIES

County	Location	Miles	Type of Surface
Orange	Newport to Corona Del Mar	4.8	Port. Cem. Con. Pave.
San Diego	Bostonia to Chocolate Creek	7.5	Port. Cem. Con. Pave.
Riverside	Avenue 62 to Avenue 74	8.3	Port. Cem. Con. Pave.
Riverside	Avenue 74 to Southerly Boundary	6.0	Port. Cem. Con. Pave.
Orange	Laguna Beach to Dana Point	4.9	Port. Cem. Con. Pave.
Los Angeles	Santa Ynez Canyon to Santa Monica	2.4	Asphalt Con. Pave.
Los Angeles	Santa Ynez Canyon to Santa Monica	----	Groynes
Kern	Oak Glenn to Grapevine Station	3.7	Bit. Treat. Crush. Rock
Riverside	Blythe to Ehrenberg Bridge	3.7	Bit. Treat. Crush. Rock
San Luis Obispo	Cambria to San Simeon	9.7	Bit. Treat. Crush. Rock
Tulare	Lemoncove to Three Rivers	8.5	Bit. Treat. Crush. Rock
Orange	Across Anaheim Bay	----	Widen Stl. & Con. Br.
Los Angeles	Across Los Alamos & Gorman Creeks	----	3 Stl. & Con. Brs.
Mono	Across West Walker River	----	Reinf. Con. Bridge

NORTHERN COUNTIES

County	Location	Miles	Type of Surface
Glenn	In Willows	0.4	Asphalt Con. Pave.
Shasta	Hat Creek Summit-Fall River Mills	8.9	Bit. Treat. Crush. Rock
Placer	Lincoln to Sheridan	6.7	Bit. Treat. Crush. Rock
Butte	Pulga Crossing to Cresta	4.4	Graded Roadbed
Mariposa	Pain Flat to Mariposa	7.6	Graded Roadbed
Santa Clara	Across Stevens Creek	----	Rein. Con. Bridge
Monterey	Across Rocky Creek	----	Rein. Con. Arch Br.

SUMMARY

Type	Miles
Portland Cement Concrete Pavement.....	31.5
Asphalt Concrete Pavement.....	2.8
Bituminous Treated Crushed Rock Surfacing.....	41.2
Graded Roadbed.....	12.0
Bridges	(7)
Total	87.5

Salt Water Barrier Plan Rejected

(Continued from page 5)

and the Sacramento-San Joaquin Delta, and thereby creating and maintaining a fresh water lake from which water supplies now available or hereafter made available from the Sacramento and San Joaquin rivers might be utilized by industries, municipalities and agricultural developments in the upper bay and delta regions.

The report contained in Bulletin No. 28 presents the results of a comprehensive investigation as to the economic aspect of a salt water barrier. This investigation has involved a survey and study of the upper bay and delta regions, with particular reference to manufacturing industries, industrial water front structures, irrigation, reclamation, flood control, navigation, fishing, municipalities, sewage and industrial waste disposal, and the effect of a barrier thereon. Estimates have been made of immediate future and ultimate water requirements for all purposes. An essential feature of the investigation has been a study of alternate plans, with and without a barrier, to provide the basic requirements of salinity control.

The following are some of the conclusions of the investigation:

1. It would be physically feasible to construct a salt water barrier at sites in Carquinez Strait and at Point San Pablo. Foundation conditions at the Chipps Island site are not as favorable for constructing a barrier at this location. The capital cost of a barrier would vary with the location and type of structure from \$40,000,000 to \$75,000,000 and annual cost corresponding to the same would vary from \$3,300,000 to \$5,600,000.

2. The amount which might be contributed from highway funds towards the building of a barrier, by reason of present facilities and savings effected, is small in comparison with the total cost of a barrier, and can not be considered a controlling factor in selecting the site, methods of financing or time of construction; and the combination of a highway crossing with a salt water barrier is not economically warranted.

3. The furnishing of an adequate and dependable cheap fresh-water supply for industries, municipalities and agricultural lands in the upper San Francisco Bay region would benefit these developments and stimulate their growth. * * * In so far as fresh-water demands of the upper bay region are concerned, the essential requirements would be the furnishing of adequate fresh-water supplies by the consummation of the most practicable and economical plan which can be devised.

4. * * * A barrier in itself would not create the water supplies required either for present or future needs of the area. The usable storage capacity would be insufficient to supply even the water required for barrier operation and unavoidable losses from a barrier lake. Only a small percentage of the tributary run-off could be conserved in a barrier lake. Therefore, the necessity and desirability of a barrier as a means of controlling salinity and serving the fresh-water demands of the upper bay and delta region must be determined on the basis of the comparative cost of a plan of salinity control and water service with a barrier and an alternate plan without a barrier providing equivalent service and accomplishments.

5. The control of saline invasion, so that water supplies now or hereafter made available in the

delta from the Sacramento and San Joaquin rivers could be maintained fresh and utilized for all purposes in the upper bay and delta region, could be provided with equal certainty without a barrier by means of fresh water released from mountain storage reservoirs to supplement the available stream flow. With salinity controlled by this means at the lower end of the delta, not only would the delta be fully protected and its water requirements satisfied, but also a fresh-water supply equivalent in dependability and quality to that in a barrier lake could be made available in the delta channels for use in the upper bay area and not far distant therefrom.

6. A barrier is not necessary for the exportation of water from the Sacramento River to the San Joaquin Valley above the delta. * * *

7. A barrier would not be essential to the feasibility of reclaiming the marshlands adjacent to Suisun and San Pablo bays.

8. A barrier would probably effect substantial savings in the capital and annual costs of water front structures in the barrier lake above, but such savings would be more than offset by the losses suffered in delays to navigation, additional costs of drainage and levee maintenance in the delta and bay marshlands, possible increased cost of navigation channel maintenance, and possible damage to the fishing industry. Moreover, construction of a barrier would precipitate a sewage and industrial waste disposal problem which would require substantial expenditures for construction of disposal and treatment works for its solution.

9. The proposed alternate plan, with salinity controlled by means of stream flow without a barrier, providing conduits from the delta to serve the fresh-water demands of the upper bay area, additional works of channel enlargement between the Sacramento River and San Joaquin River Delta and works for the reclamation of the upper bay marshlands, could be consummated for a capital and annual cost of less than half that required for a plan of equivalent scope and service with a barrier. It would have the additional advantage of requiring immediate expenditures of but a small fraction of the cost of a barrier for initial conduit units that would amply serve the needs of the immediate future. * * *

10. All present and ultimate fresh-water requirements and the complete development of the ultimate potentialities of industries, municipalities and agricultural lands in the upper San Francisco Bay region would be provided for under the proposed alternate plan of development and service, with salinity controlled to the lower end of the delta by stream flow supplemented with fresh-water releases from mountain storage. The plan would include main conduits extending westerly from the delta along the north and south sides of the bay, located and designed to serve the fresh-water demands in the upper bay area. The upper bay channels would continue to serve as outlets for sewage and industrial waste and as a source of supply for cooling and condensing water for industries, with advantages resulting for both purposes. Preliminary designs and studies of the proposed plan demonstrate its physical feasibility and eco-

AN APPRECIATION

Dear Sir:

This communication is prompted by the writer's very favorable experience with two men under your supervision, Messrs. Maudsley and Heaschman, on a recent Sunday evening, when my car was partially inundated by a minor landslide approximately one mile south of Oakwild. Soon following my mishap, the above named gentlemen passed and requested that the writer and his companion share their food and lodging for the night. The invitation was accepted and we were shown every expression of courtesy. Early Monday morning with the aid of one of your crews they freed my car from the accumulated soil.

If this is the type of treatment an unfortunate traveler can expect while in the mountains, it seems but reasonable that some effort be made to bring the favorable facts to the attention of those to whom these men are responsible and who govern the welfare of their positions.

Very truly yours,
(Signed) J. E. EDWARDS,
California Bank, Los Angeles.

"Bothered much by hitch hikers when you're out riding?"

"Not now. Tried a new plan. As soon as I get out of town I show the sign 'Taxi' on my car."—*Boston Transcript.*

BULLETIN PRESENTS FINAL CONCLUSIONS

(Continued from preceding page)

nomical advantage and give assurance of satisfactory service. * * *

11. Water in the amounts that might be saved in controlling salinity with a barrier would be available and could be furnished at considerably less cost from mountain storage reservoirs. The conservation efficiency and value of a barrier would be small in comparison with the cost.

12. The final conclusion of this investigation of a salt water barrier located at any of the three typical sites is that this structure is not necessary or economically justified as a unit of the State Water Plan.

In addition to the main report, Bulletin No. 28 includes several supplementary reports on special investigations each made with special reference to a salt water barrier, which are presented as appendices to the main report, and comprise the following:

The bulletin was prepared under the direction of A. D. Edmonston, Deputy State Engineer, by Raymond Matthew, Hydraulic Engineer, with E. E. Blackie as principal assistant. The field work in connection with the investigation of salinity was under the immediate direction of Harlowe Stafford, Hydraulic Engineer. J. J. Haley was administrative assistant to State Engineer.

The bulletin was outlined and prepared with the advice of, and in consultation with, an advisory committee of consulting engineers. The personnel of the committee was: G. A. Atherton, G. A. Elliott, B. A. Etcheverry, C. E. Grunsky, A. Kempkey, C. T. Leeds, C. D. Marx and T. H. Means.

Erratic Oil Valve Causes Impromptu Skidding Tournament

AS THE cold gray dawn was making a belated appearance on January 12th last motorists on the Newhall Tunnel Road suddenly began skidding and squirming all over the highway. Their cars gyrated crazily, entirely out of control like things bewitched. One car skidded and did several flipflops. Others mingled promiscuously in several minor accidents but fortunately nobody was hurt.

The paved highway had been turned into a sliding pond with a good coating of light oil all the way from Castaic Junction to Oak Glen and cars couldn't make the Newhall Grade without getting out on the dirt shoulder.

An investigation revealed that an oil company's truck and trailer had done the road-greasing job when a valve on the trailer came open and unknown to the driver distributed 900 gallons of light fuel oil over the road.

Foreman Charles Harbey of District VII Division of Highways, stationed at Saugus, was notified by the sheriff's office and quickly got out his crew. Some were equipped with red lanterns and sent up and down the road warning all traffic to proceed with caution, while others hauled truckloads of sand to spread on the curves and grades.

Twenty-eight men and five trucks worked from 6.15 in the morning till about 2.30 in the afternoon hauling and spreading 130 tons of rock dust over the miles of slick pavement. The bill sent the oil company totaled \$396, exclusive of the oil lost, and all through the failure of a valve to do its duty.

FORESTS BRING CASH

California gets the largest returns received by any state from its national forests, according to advices reaching the Automobile Club of Southern California. The return, including the fiscal year 1931, will be \$4,311,456, representing 25 per cent of the gross revenues.

The teacher explained to the class, "Words ending in 'ous' mean full: as, 'joyous' means full of joy. 'Vigorous' means full of vigor. Now will some one give another example of such words?"

The boy with the scratch on his nose raised his hand. "Pious," he answered.—*The Kalends.*

As a hint to motorists whose driving is liable to get them into trouble, an eastern town has been utilizing posters bearing the legend: "Free parking—for careless drivers." Below is a convict sitting on the edge of his cell in the posture of the famous statue, "The Thinker."

State Tenth in Highway Expenditures

(Continued from page 1)

tration, is far behind comparable states. California, in comparison with the other great states of the Union, is investing a minimum amount in its State highway system and if the system is to adequately serve the California motorists and is to provide satisfactory lanes of travel throughout the State, that investment must be jealously guarded and judiciously expended.

ROADS ADDED

California has adopted a systematic and economic plan for State highway improvement known as the Ten Year Plan by which the funds will be adequate under the present law to improve the State highway system, as it existed in 1930, to a standard adequate to serve traffic in 1942. This plan does not provide, under the present financial set-up, for the construction of mileage added by the last Legislature, or that may be added by future legislation, without further provision being made for increased revenue. Progress toward the goal set by the Ten Year Plan is well under way.

If the California motorist were to demand the speeding up of work on State highway development and the completion of the proposed 10-year program at an earlier date, an increased revenue would have to be provided, and in this connection let Californians remember that in 1931 there was only one State in all of the forty-eight with a lower per car expenditure rate for State highways than California. The state of Ohio spent only \$17.05 per car while California spent only \$18.65 per car. Louisiana's expenditures per car were the highest, being \$145.31, and Nevada was second with \$145.05. The average for all states amounted to \$39.14, so that the cost per car licensed in this State was less than one-half the average for the forty-eight states.

In per capita expenditures on its highways California ranked thirty-seventh in 1931 with \$6.71 expended per person of population. Nevada's per capita expenditure was the highest of any of the forty-eight states at \$47.22, and the average for the entire United States was \$8.47.

Cooperative Plan an Aid to Cities

(Continued from page 7)

Statutes 1931) authorizes the improvement by the State from State Highway funds at the option of and on a routing determined by the California Highway Commission of portions of State Highway within city limits, where "the natural course of a State Highway or State Highway System passes into or through any municipality or contiguous municipalities."

Q. Has the California Highway Commission adopted a policy in this regard?

A. Yes. A cooperative plan. Upon the request of the city authorities by proper resolution, the California Highway Commission will investigate the location of a routing connecting the State Highways on either side of a municipality to form a continuous highway or highway system as will be of the greatest benefit to traffic upon the State Highway; will, if the State and City authorities reach a cooperative agreement, adopt and take over such routing; and will construct or improve such connecting portion to the same width or to the same standard as the State Highway on either side of such municipality, paying for such improvement with State funds appropriated or available for such purpose.

Q. Are the cities expected to aid?

A. Yes. On State Highways which are main traffic routes the municipality is required to furnish to the State a right of way with a minimum width of 80 feet, providing for an ultimate development of highway 76 feet wide between curbs. Sidewalk space, if desired, is to be provided by the municipality in addition to and outside the 80-foot right of way.

On State Highways of less importance and carrying a limited volume of traffic, sidewalk space may encroach on the 80-foot right of way but only to the extent that a 56-foot ultimate width of roadway is provided.

Construction of curbs and sidewalks and the improvement by paving or surfacing of the remaining width of roadway between curbs not improved by the State, will be an obligation of the municipality and should be defrayed from municipal funds available for such purpose. Installation, removal, or renewal of water, sewer, gas, and such other facilities under municipal jurisdiction shall be done at the expense of the municipality.

Upon completion of the improvement of the routing, the city is to resume jurisdiction and take back the improved routing and maintain the same.

Committee to Ask New Codification of Motor Vehicle Act

THE 1931 Legislature appointed a special committee of five of its members composed of State Senators William E. Harper of San Diego and Ray W. Hays of Fresno, and Assemblymen William B. Hornblower and Joseph P. Gilmore of San Francisco, and Bert B. Snyder of Santa Cruz, to study motor vehicle legislation during the legislative recess and recommend to the 1933 Legislature such revision of or additions to such laws as they may find to be necessary and proper.

The organization meeting of this committee was held at Los Angeles March 18, 1932, and was attended by officials of the State Departments of Finance, Motor Vehicles and Public Works, the State Railroad Commission, city and county officials and representatives of the automobile clubs, motor car dealers, truck and stage operators, motor car users and other interested groups.

Assemblyman Hornblower acted as chairman of the conference, which will hold another public meeting in the new State Building at Los Angeles on May 27, 1932, to receive suggestions of changes in the motor vehicle act and to receive the reports of the subcommittees on different phases of the licensing and operation of motor vehicles on the public highways of California.

It was decided by the conference to request the Legislative Counsel Bureau to draft a new codification of the act in due season for consideration at the next Legislature, including the amendments finally proposed by the special legislative committee.

Million Tourists Will Find Clean Roadsides

A million automobiles from east of the Rocky Mountains will be driven to the Pacific Coast in 1932, according to an estimate based on a nation-wide survey received by the touring bureau of the Automobile Club of Southern California. This will be more than double the normal number of motorists reaching the State, as it is assumed that practically all of these tourists will come to Southern California because of the Olympic Games.

It is further estimated that the average trip for motorists to the Pacific Coast and back will consume approximately 22 days,

TOAST TO THE ENGINEER

HERE on the open roadway,
With none but the pines to hear,
I give you a toast to the Builders,
To the Highway Engineer.

To the men with sun-tanned faces,
To the Poets of Curve and Line,
To the Sculptors who work in concrete,
To the Artists of Bridge Design.

Have you seen them, dirty and sweating,
Pounding their stakes on the hill,
Squinting keen eyes through the transit,
Planning the "cut" and the "fill"?

Have you passed them, perhaps, on some
detour,
A strong-limbed, clean-eyed crew,
Chief of Party and rodman and chainman,
In a car of the Highway blue?

Cutting their noon hour to finish a shot,
Plotting their notes at night,
The youngest "S. I." writing home
By the flickering lantern light.

Tolerant, genial and kindly,
Helping each other along,
Dusty and tired and sunburned,
Building your roads with a song.

So I pause on the open roadway,
Where none but the pines can hear,
And I give you a toast: To the Builders,
To the Highway Engineer!

GLADYS CRAIG POTTER.

(Wife of C. A. Potter, Maintenance Superintendent, Placer-ville, California.)

The number of automobiles registered in the United States last year was 25,940,000, according to figures gathered by the Automobile Chamber of Commerce. There were 22,450,000 motor cars and 3,490,000 trucks.

Recognizing the impossibility of removing all traffic hazards to children going to and coming from school, the California Committee on Public Safety will seek the support of school authorities in a policy of locating school buildings at other points than on boulevards and similar main arteries of travel.

and the average expenditure per car will be approximately \$23 per day. These cross-country motorists will spend approximately \$500,000,000 in the cities and towns and along the roadside on the main highways to the Pacific Coast.

More than one progressive city stirred by proper pride in their State have been cleaning up and beautifying the highways in their vicinity to the end that California's natural attractions shall not be spoiled for the visitors by unsightly roadside. Many unemployed men are being given work by certain cities in this way while in other communities steps are being taken to prevent the dumping of tin cans and other refuse on vacant lots along the highways.

Safety on Highways to Be Discussed at Joint Group Session

“**H**OW may we reduce our traffic accidents,” will be the principal theme of a joint meeting extending over three days to be held by the California Committee on Public Safety and the Municipal Traffic League of California at Santa Cruz May 5 to 7.

Leading officials and traffic experts from all parts of the State will join in considering all aspects of the problem and try to work out a state-wide plan of action.

The two groups are composed of State, county and municipal officials from all parts of California, as well as citizens and representatives of motorists' organizations and other elements interested in promoting traffic safety.

In 1931 the number of persons injured in traffic accidents in California was 48,077. Many were maimed for life and 2591 deaths resulted. This was an increase of 16.6 per cent over 1930 in the number of injured and an increase of 8.7 per cent in fatalities. The increase in accidents was 12.9 per cent.

The California Committee on Public Safety and the Municipal Traffic League have each heretofore held their own separate annual conventions.

Four Forces Road Builder Must Fight

Abrasion. Suction. Shear. Impact. Wherever vehicles move on roads, they exert these four destructive forces which must be met and overcome by the road builder. How these four forces work was shown in a series of posters by the Bureau of Public Roads at the recent Road Show at Detroit.

Abrasion is the force which grinds down the road surface if permitted. But abrasion has been conquered by fitting the former steel shod grinders with rubber shoes.

But though rubber tires vanquished abrasion, they brought suction, the force which lifts into the air and disperses the finer particles of surfacing material. This force made the old water-bound macadam roads useless, and it quickly destroys gravel roads. It is cheaply prevented by treatment with bituminous material.

Shear is best illustrated by a solid-tired wheel cutting ruts through an earth road softened by rain. Rigid pavements of concrete or other materials on a concrete base have ample strength to resist shear.

Impact is the pounding of wheels on the road surface. A slight roughness of the road, or small obstacles, may cause an impact much greater than the actual weight of the load.

Olympic Visitors Will See Many Public Works in Progress

MOTORISTS from other states who tour California during the Olympic Year will not find the southland all play, as there will be many enormous construction projects under way while the leading athletes of the world are competing for sports supremacy, says a statement issuing from the Automobile Club of Southern California.

A recent survey indicates that there will be approximately three-quarters of a billion dollars worth of improvement work being done in this region. These projects include dams, breakwaters, railway terminals, flood control projects, power development, factories, state and federal buildings, harbors, canals and aqueducts.

The largest among these developments is the Los Angeles-Colorado River Aqueduct, which will cost in the neighborhood of \$220,000,000. The All-American Canal in Imperial Valley has been authorized at an expenditure of approximately \$34,000,000.

Modern Social Life Depends on Highways

Most anyone will admit that highways play an important part in the social and business life of the Nation. Questioned as to just how the benefit is derived, most people are hazy.

Just suppose there were no highways, or that the road you now use either did not exist or perhaps was full of bumps and mud holes. What would you do about the poor road—or no road?

Out of six million farms in the United States, three million are on unimproved roads and two million more have only a dirt road according to Chester H. Gray, of the American Farm Bureau Federation, in testifying before a United States Senate committee on roads. Only about one-sixth of the farms of the United States are on surfaced highways.

Good roads have done more to aid living conditions in the country than any other agency. The highway is as essential to agriculture and merchants who sell the farmers supplies as the railroad and steamboat are to industry, Mr. Gray believes.

Chairman Kelly of Highway Board Made Tax Bureau Chief

A NEW honor came to Earl Lee Kelly, of Redding, chairman of the California Highway Commission on March 21 when Governor James Rolph, Jr., appointed him director of the State Tax Research Bureau, a creation of the 1931 Legislature. Mr. Kelly will continue as chairman of the Highway Commission, an unsalaried office, in which he has made an outstanding success.

His appointment completes the organization of the tax bureau which is charged with making a report to the 1933 Legislature on the results of research work covering methods for an equalization of State taxes. In naming Mr. Kelly to the directorship, Governor Rolph cited his successful career as an organizer and tax expert resulting from a wide knowledge of tax matters gained through long association with the abstract and title business as president and general manager of a large Shasta County company.

Mr. Kelly spent his boyhood days in Humboldt County, graduating from the Eureka High School. He is a graduate of the law department of the University of California, class of 1915.

After returning from service in the World War, Mr. Kelly engaged in the title and insurance business in Redding. In addition to becoming a leading business figure of that city, Mr. Kelly took an active and prominent part in the civic and political life of that community.

He has served Redding both on the City Council and as Mayor of the city. He has also been prominent in State political affairs, and is an active member of the Republican State Central Committee.

During his life-long residence in northern California, Mr. Kelly has become exceptionally well versed in State Highway problems and policies. He brings to these problems a seasoned and successful business judgment, gained both in the conduct of his own business, and in the course of his official service for city and State.

As chairman of the California Highway Commission, Mr. Kelly has personally inspected nearly every mile of highway in the State system spending many hours and days of arduous travel in the conscientious effort to thoroughly familiarize himself with the highway needs of all sections of the State.



EARL LEE KELLY

\$1,611,580 for Forest Fire Prevention Aid

INTERESTING to motorists and others concerned with the protection and preservation of scenic areas and natural resources is a report received from Washington, D. C., regarding forest fire prevention measures now before Congress.

"To date, every appropriation bill has been thoroughly scanned and a great many cuts have been made here and there" says the report. "In this connection, the Clarke-McNary Bill, providing for government co-operation with the states in fire prevention, has been cut from \$1,750,000 to \$1,611,580. It will be readily seen that the decrease is in no sense serious. The annual appropriation of \$100,000 for fire prevention work by the forest service is unchanged.

"The Department of the Interior appropriation bill usually carries an item of \$80,000 for fire prevention in the national parks and \$40,000 for lookout stations. The bill now pending in the House carries the \$80,000 for fire prevention, as heretofore, but the \$40,000 has been reduced to \$10,000."

Riverside Fetes Governor and Highway Officials at Rubidoux Bridge Dedication

THREE interesting events gave to the city of Riverside the atmosphere and importance of the State Capital, for two days March 28th and 29th, when the California Highway Commission held a regular meeting in the Riverside County Court House and Governor James Rolph, Jr., with other members of his executive family, participated in dedication ceremonies attending the acceptance and official opening of Buena Vista Avenue and Rubidoux Bridge at the westerly entrance to the city.

Riverside was gaily decorated and in festal spirit during the two days, and State officials were entertained at numerous functions extended by city, county and civic body officials.

Riverside is the home of State Highway Commissioner Frank A. Tetley, who took a leading part in arranging and supervising the program of events. The commissioner was diligently active in securing the improvement of both bridge and avenue and donated a stately 40-foot Cocos Plumosas palm tree that Governor Rolph planted at the entrance of the bridge in honor of the occasion.

TETLEY HONORED

In appreciation of these services Commissioner Tetley was made master of ceremonies at a dual celebration that was marked by military pomp and civic pageantry.

A military parade escorted the official party to the scene of the ceremonies, led by motorcycle officers with Governor Rolph and Commissioner Tetley at the head of the procession. A band and detachment from the U. S. Army Post at March Field; Company "C" of the 185th Infantry, California National Guard; an R. O. T. C. band and battalion and a detachment and band from the Sherman Institute Indian School composed the escort.

Upon arrival at Rubidoux Bridge Governor Rolph reviewed the parade from the official platform and then proceeded to plant the palm tree in a specially prepared niche on the bridge approach.

Introduced by Commissioner Tetley, Governor Rolph made the principal dedicatory address at the bridge ceremony and also officiated at the dedication of an ornamental drinking fountain, donated by the Lions Club, and located in a picturesque setting at the foot of Mt. Rubidoux opposite the entrance to the bridge.

OFFICIAL LUNCHEON

Following the ceremonies the parade reformed and escorted the official party back to the Mission Inn where a luncheon was given by Mayor John S. Long, the City Council and Board of Supervisors of Riverside County, with Governor Rolph as the guest of honor and principal speaker.

After the luncheon Governor Rolph visited March Field stopping en route to make a brief talk to the students of Junior College. On arrival at the army reservation, the Governor was given a 17-gun salute and officially received by Colonel Arnold, commanding officer. The military program that followed included an exhibition and review of 100 bombing planes.



FRANK A. TETLEY

On his return from March Field, Governor Rolph inspected the University of California Citrus Experiment Station.

In the evening the Governor was guest of honor at a dinner given by the Present Day Club and addressed this body of 500 prominent citizens of Riverside.

The improvement of the westerly entrance to Riverside has been a project in which city and State have cooperated. The city of Riverside carved the splendid, wide Buena Vista Boulevard out of the rocky hillside. It is a fine road, an easy riding road, a safe and beautiful road with probably the most beautiful entrance of any city in the State, leading to the bridge across the Santa Ana River. The hillside has been terraced, an ornamental railing has been built, an attractive stone arch separates highways that cross.

BRIDGE REMODELED

The road has been lighted. Trees and shrubs have been planted. At the side of the road there is a



RUBIDOUX BRIDGE, at the foot of famous Mount Rubidoux, spans the Santa Ana River with five graceful concrete arches and carries the State highway over a 45-foot roadway to the western portal of the city of Riverside, beautiful Buena Vista Boulevard. The widening and rebuilding of both bridge and boulevard by State and city was celebrated with dedication ceremonies at which Governor Rolph and city officials officiated on March 29.



HIGH ART in landscaping and roadbuilding is exemplified in this beautiful Buena Vista Boulevard, the western gateway to the city of Riverside leading from the newly completed Rubidoux Bridge. It sweeps up from the Santa Ana River around the foot of famous Mount Rubidoux in a broad, easy curve of fine wide roadway. The sides are terraced and embellished with rock work and planted shrubs and trees add arboreal beauty to the ensemble.

lovely waterfall and a fish pond. The artistic palm niche with benches adds to the attraction of the spot.

The State has taken the old narrow bridge with its five graceful concrete arches which headed directly into the mountain side, and remodeled it to fit the new road. The sharp right-angular turn has been replaced with a long sweeping curve. The deck width has been doubled and a sidewalk has been added. The tall pylons or towers which graced the portals of the

old structure, have been moved bodily to fit the new bridge width. A beautiful railing of Indian pattern, similar to that used by the city, has been placed upon the bridge. Ornamental light posts have been installed.

This new structure, 500 feet in length, composed of five arch spans, now has a width of 45 feet. The south abutment is founded on rock. The balance of the bridge is founded on concrete piers extending 20 feet into the ground, supported on piling.

U. S. Bureau Traces 90 Per Cent of Highway Dollar Into Workers' Pockets

AT LEAST 85 per cent and possibly more than 90 per cent of the money expended for a concrete pavement is ultimately paid out as wages and salaries, according to the Bureau of Public Roads of the U. S. Department of Agriculture.

This conclusion is reached as a result of studies of typical concrete construction jobs and it is believed to be approximately true for other high-type pavements. Expenditures were traced back through various channels by the Bureau until the money went into personal use.

About 15 per cent of the cost of concrete pavements is paid to men employed directly on the construction jobs, the report says. About 12 per cent is paid to men employed in quarries, sand pits, mills and factories where the materials are produced, and about 14 per cent is paid to men employed by the transportation companies (principally the railroads) for hauling these materials to the jobs.

WIDELY SPREAD

Part of the cost is paid to the men who build the machinery and equipment used in constructing highways. Even more is paid to the men who build the machinery and equipment used in the sand pits, the quarries, the cement mills and the steel mills where road materials are produced and to those who build the equipment of companies that deliver these materials. Some is paid to the miners, the men who work in the refineries, and those who work on the pipe lines and in the oil fields—the industries which provide the fuel that produces the power used in producing materials, in transporting them, and in working them into finished pavements.

A part of the cost of high-type roads goes to those industries which furnish the supplies used all along the line. Some goes to the men who make blasting powder; some to those who make hand tools, and even the very minor items, such as cotton waste and the sheet of emery paper with which the mechanic smooths a joint on a machine he is repairing, absorb a bit of the cost at which pavements are built.

About 75 per cent of the cost of a high-type pavement filters back through the trans-

portation companies and through industry to men who work for salaries and wages at points distant from where these highways are built. Most of these men are city workers employed by the transportation companies or in the mills and factories—men who may never see more than a few of the highways their efforts help to build but who, taken together, receive several times as much in salaries and wages as is paid to the men who are directly employed in building them.

The Bureau's studies further show that out of every \$100 paid to the contractors who build concrete pavements—and much the same thing is true of high-type highway construction generally—more than \$40 passes through the hands of the transportation companies (principally railroads) and assists these companies in maintaining a profitable volume of business. Approximately \$13 is paid to the producers of aggregate (sand, gravel, broken stone and slag); about \$24 goes to the cement mills. At least \$16 ultimately goes to the manufacturers of machinery and equipment including trucks, railroad cars, locomotives, etc.

ADDS BUSINESS VOLUME

Some is paid to the manufacturers of explosives; some to the producers of coal; some to the gasoline refineries; and much to manufacturers who contribute in lesser degree by supplying materials used by those who produce the materials used in highway construction, and those who transport them or who build the equipment used at some point in the long series of processes out of which highways result.

From these facts it is apparent that the construction of highways, particularly those of the higher types, not only provides work for those employed on the job but that it provides a great deal more work for men employed in industry and in transportation; and that, in addition to this, it supplies a large volume of business to those industries through which the materials that must be used are collected, worked and reworked before they become a part of a finished pavement.

Stakes Don't Always Tell Where a Road Is to Be Located

WHEN you see a crew of State engineers making a survey, it is no sign that a new highway will be built immediately, or that it will go where the stakes are set. The presence of engineers often leads to erroneous reports as to the time certain routes will be improved and the place they will be located, and such rumors have caused some communities needless worry.

Stakes are no indication where the road is going. Preliminary surveys may be made of several tentative routes. This information is necessary in determining the best and most economical route. Drainage surveys and land surveys are often necessary, and require the engineer to cover considerable territory on both sides of the route.

When the engineer's reports reach the central office, computation is made of the dirt to be moved, bridges and culverts needed, cost of right of way, etc. Steep hills, swamps, railroad crossings, farm buildings and groves, connecting roads and streets, scenic features, and snow conditions, are all factors to be considered. If traffic on the route is heavy, expensive construction may be undertaken to save a mile or half mile, while if traffic is light, a slightly longer and less costly route may be chosen. Both local and long distance traffic must be considered.

Sometimes the survey shows the cost of the project greater than anticipated, and the plans may be filed away until more funds are available. Or a resurvey may be ordered. Frequently by running several lines and selecting the best route, the saving in construction costs will be many times the cost of the survey.

Making a survey and preparing plans for a construction project requires several weeks, sometimes months. The department aims to keep its plans and surveys well ahead of actual construction, and after bids are opened it takes but little time to complete the contracts and get equipment on the job.—*Minnesota Highway News*.

COUNTY CAR CENSUS

The total registration of motor vehicles in Fresno County at the end of 1931 was 60,487. This figure represented 52,519 passenger automobiles, 3034 pneumatic tire trucks, 312 solid tire trucks, 3980 pneumatic tire trailers, 421 solid tire trailers and 221 motorcycles.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
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Million Men in U.S. Given Employment On Roads Last Year

THE effectiveness of road construction in providing jobs for the unemployed was tested in 1931 by the Federal Government with the result that practically all the funds appropriated amounting to \$80,000,000 emergency, and \$125,000,000 annual Federal aid were expended by September. During the summer the States and Federal Government with joint funds of \$447,500,000 employed 386,000 men in road building work. City and county expenditures added to those of the states and Federal Government. The number of men employed on road and street work probably numbers a million.

Needed road and street improvements have been effected as well as relief given to the unemployed. The results of this road building will remain long after the depression is forgotten—the national wealth has been increased. Roads and streets have been underproduced in the last decade. The improvement of the 2,300,000 miles of primitive earth roads scarcely has been begun. This needed work has been accomplished at a decreased cost to the public. This saving has not been effected through wage reduction but rather through other economies.

This is but a part of the story. The road building dollar—75 per cent of it—is paid to labor. The cost of building country roads has been transferred almost entirely from real estate to motor vehicles. Owners of motor vehicles are compensated in the decreased cost of operation on good roads. Real estate now pays scarcely a third of the road costs. The gasoline tax and motor vehicle fees return a billion dollars for highways in states, counties, and cities.—*American Road Builder*.

Historic Gaviota Pass Widened and Paved; Scenic Beauties Conserved

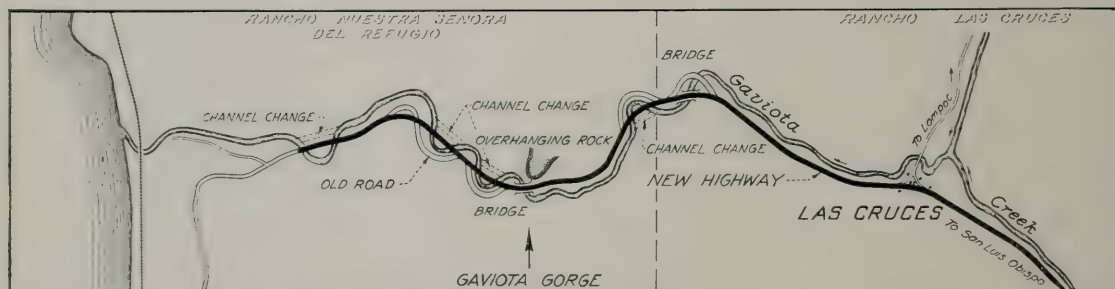
By G. A. TILTON, Jr., District Construction Engineer

GAVIOTA Gorge in Santa Barbara County has been noted as a point of historical interest ever since General Fremont's military forces, marching to the aid of the Los Angeles Garrison in December, 1847, were forced to detour that canyon and travel via San Marcos Pass.

General Fremont, marching south, received word that the Californians and Indians were hiding in the narrow defiles of Gaviota Gorge and planned to open an ambush attack by rolling large rocks from the high cliffs. He avoided the ambushade by going over San Marcos Pass and was able to capture Santa

Original highway construction in Gaviota Gorge was performed in 1915, which served adequately until the increase in volume of traffic on the Coast Route, known as U. S. Route 101, demanded reconstruction. This was completed during October, 1931, and as built provides a permanent highway with increased safety and convenience to the traveling public.

The new pavement is of reinforced concrete 20 feet wide, the graded width being 36 feet as contrasted with the 21-foot width that formerly existed. Mixed oil shoulders eight feet wide are on each side of the pavement.



Map of improved highway through Gaviota Pass

Barbara without bloodshed, while the enemy awaited him 35 miles away.

NOTED FOR SCENERY

Not only is this natural pass to the Santa Barbara Coast of historical interest, but it is also famous for its characteristically beautiful scenery and fantastically-shaped natural rocks. It is the gateway to the coast that has been used by coastwise traffic since the earliest days of California history.

When the reconstruction of three miles of highway through Gaviota Canyon was planned, it was only natural that the residents of Santa Barbara County should be greatly concerned lest the scenic attractions of that area should be destroyed. Only after State Highway engineers held numerous conferences on the ground with officials of the Santa Barbara County Planning Commission, the State Park Commission and principal owners, was it possible to allay their fears to the extent of accepting the State plans.

It was necessary to make several major changes in the location of Gaviota Creek to avoid bridge construction and build several heavy concrete retaining walls to sustain and protect the roadbed.

Top soil was placed over the slopes of rock fills to promote a more rapid growth of vegetation. Planting of native trees and shrubs will be done by the State.

The project includes one bridge at the Gorge and cost the State \$270,000, or \$90,000 per mile. This marks it as one of the most expensive sections of highway in Santa Barbara County.

It is evidence of the fact that the California Highway Commission recognizes that natural scenic attractions *must* not be destroyed and expressions of opinion on the part of the people of Santa Barbara County have been very complimentary. It is generally stated that the traveler through Gaviota Canyon may now see more scenery than he ever could before.



CALIFORNIANS HID in this picturesque Gaviota Pass in 1847, seeking to ambush General Fremont marching to the aid of U. S. forces in Los Angeles but he detoured over San Marcos Pass and fooled them. The view shows a part of the newly improved State highway through this famous old gateway to the coast.



A NATURAL AMBUSCADE was provided by this overhanging rock at the narrowest part of the pass where the Californians planned to roll boulders down upon the American troops. A bridge carries the new highway over Gaviota Creek at the foot of the rock.



Cars Averaged 300 More Miles in 1931

MOTORISTS throughout the country averaged 300 miles more of travel per car last year than in 1930. This conclusion is based on the gasoline consumption, which was 500,000,000 gallons more than the preceding year. This showing is made in the face of a reduction of 1,000,000 cars in the production for 1931.

The average tax paid by motorists in 1931 exceeded \$40 per vehicle, or approximately 18.3 per cent of the value of the average car.

Motor vehicle registrations dropped in nine of the ten states having the highest average taxes. Normal increases in auto registrations occurred in nine of the ten states having the lowest taxes on vehicles.

According to a statement from the president of the Automobile Chamber of Commerce, thousands of families were willing to sacrifice luxuries and even so-called necessities in order that they might not be denied the use of their cars.

Warning of Flood Stage Broadcasted

(Continued from page 10)

concrete sill of the weir, forming a lower crest at elevation 25.0 feet, U. S. E. D. The project flood plane at the weir is at elevation 34.5 feet.

EASILY OPENED

The gates are simply and easily opened by releasing the timber beam which holds the needles upright; but the process of closing the gates is slow, cumbersome and costly. Investigation has been made as to the desirability of replacing these gates with ones of a type which can be operated more easily, but it has been concluded that as the gates are seldom operated and the installation of new gates would necessitate remodeling the weir at a heavy cost the change would not be justified.

The official project capacities of the channels affecting the Sacramento weir are: Sacramento River above weir, 107,000 second-feet; Sacramento weir, 112,000 second-feet; American River, 128,000 second-feet; Sacramento River below Sacramento, 110,000 second-feet. These are theoretical quantities and the apparent excess of inflow over outflow of 13,000 second-feet is assumed to be eliminated by the probable flattening of flood crests by channel storage.

The Sacramento weir actually discharged 131,000 second-feet in March, 1928, at a height 1.7 feet below the theoretical maximum height. The works of the American River Flood Control District are designed for a flow of 180,000 second-feet in the American River.

SCHEDULE APPROVED

The operation, control and jurisdiction of the Sacramento weir are under the direction of the State Engineer, as provided in Chapter 343, Statutes of 1925. The present schedule under which the weir is operated was approved by the California Debris Commission in 1926 and has been reapproved for each calendar year since that time. This schedule provides:

That no gate shall be lowered while the U. S. Weather Bureau gage in the Sacramento River at the Southern Pacific bridge reads less than 26.5 feet; that any gates lowered be raised promptly when their lowering has served its purpose; and that the operation be conducted so that a safe stage of 28.3 feet on the above mentioned gage shall not be exceeded, if possible.

This schedule is designed to hold the water height at Sacramento about three feet below project height for the protection principally of the North Sacramento territory which is now without levees.

During flood, the flood control and reclamation section of the Division of Water Resources has a crew available at all times which can commence opening the weir gates upon notice of one-half hour, and can complete the opening in one hour thereafter. The gates are closed by hand, a tractor derrick being used to lift the heavy timbers. This operation requires about three days. During floods when water is against the gates the weir is patrolled to prevent unauthorized opening of gates and is lighted at night.

WARNING GIVEN

The main consideration in the operation of the weir is to determine the proper time to open the gates and the number to open. This is done by obtaining

continuous reports of the gage heights on the Sacramento, Feather and American rivers, with reports of rainfall, and by means of curves previously prepared, the quantities of water to be expected from the various tributaries and the times of arrival at the vicinity of Sacramento can be predicted with considerable accuracy. The curves used are based upon actual measurements of flood flows in previous years.

No hard and fast rule can be applied as to opening the gates on account of the number of variable factors to be considered and the final determination is a matter of judgment. The public's knowledge of the conditions are so vague that during the flood excitement the office is besieged with urgent requests to open the gates at unsuitable times. When it appears flood stage will be reached in the Sacramento River and that the weir gates may be opened, warning will be broadcast by telephone and radio.

The area chiefly affected by the opening of the gates is in the Yolo by-pass, at the southerly end of which there are several tidal reclamations always flooded by the released waters if they have not already been flooded by waters reaching the Yolo by-pass from other sources, such as the west side streams and over the Fremont weir.

OPERATION IN PAST

On December 14, 1922, at 2 a.m., seven of the 48 gates were opened for the first time, at a gage reading of 25.4 feet.

Forty-four gates were tripped on February 6, 1925 at 27.5 feet gage height, which was effective in holding the stage to 28.0.

On February 18, 1927, six gates were tripped and remained open until noon on the 21st when 24 more were tripped by 4 p.m. These 30 gates were able to hold the water to a gage height of 27.3 for the four-day period.

During March, 1928, a sharp and rapid flood, chiefly in the Feather, Yuba and American watersheds, developed suddenly, requiring the gates to be opened with little notice. This was ordered at 11 a.m. on March 25, 1928, when the gage read 26.5 feet. Twenty-four hours previously the gage head read 18.5 feet. At 1.30 p.m., 18 gates had been opened and the water was held at 27.1, the reading when the opening began. The opening of gates continued, 47 being opened by 3 a.m., when the river crested at 29.5 feet.

The flow in the American River reached the greatest of record, 184,000 second-feet at Fair Oaks, causing considerable damage in North Sacramento where the overflow was two feet higher than in 1925. The closing of the gates began on March 29 and was completed on April 5.

The Division of Water Resources has charge of project maintenance, as provided in Chapter 309, Statutes of 1931.

The levees and other works, maintained by the Division are in excellent condition and no difficulty is anticipated should a flood occur this season. This Division is prepared with organization and equipment to assist in emergency levee protection work on other parts of the project in case dangerous conditions develop during high water.

Heights up to Ten Feet Found Best for Reflector Signs

(Continued from page 9)

(c) The letters are too slender, that is, the width is too narrow for the height.

(d) The letters should be white on a black background. In the daytime reflectors appear white. With black letters on a white background, the reflectors reduce the amount of black to such an extent as to render the letters almost invisible except at very short distances.

CONDITIONS GOVERN

It is not to be presumed that these experiments prove that the reflector type sign may replace the electrically illuminated sign entirely. Under certain conditions of alignment, density of traffic, or roadside light competition, the reflector type will be useless. Each location will require a separate study; and, inasmuch as the signs, whether of the reflector or illuminated type, are, as recommended, quite expensive, the study should be thorough and complete.

However, in an illuminated sign the size and proportion of the letters, as well as the general composition of the sign, should be governed by the same principles used in the makeup of the reflector type signs. As mentioned heretofore, letters to be legible should have sufficient width and open spaces as to allow the letters to stand out from the background.

Letters such as "W," "A," "M," etc., should be wider than those commonly used. A square effect given the letter "O" makes it difficult to differentiate it from a "D." Both should be more rounded. Likewise, "S," "C," "G," should be curved, with longer radii than has heretofore been the practice.

LEGIBILITY TESTS

A sketch showing the recommended composition of a typical directional sign is included herewith. Legibility tests show that a sufficient vertical distance between the two lines of letters is less confusing. By the same token, the arrow should be sufficiently removed from the letter. It is considered that by placing the arrows as shown with the indicated proportions, no difficulty will be experienced in determining the direction as soon as the sign becomes legible. An arrow at the end of a word tends, at a distance, to con-

Roads Not Keeping Pace With Increase of Motor Vehicles

THE number of motor vehicles has increased 40 per cent in the past five years while the amount of road building has shown a growth of only 13 per cent, according to W. R. Smith, president of the American Road Builders' Association. He believes the need for making up the deficiency in highways is urgent both from the standpoint of economy of travel and safety on the public roads.

"Taxes on land for highway purposes have been relieved in a large measure by motor vehicle taxes on highway users who pay as they ride," stated Mr. Smith. "It must be remembered that highway travel depends on the road as well as the motor vehicle—one is useless without the other. Money paid for freight and passenger fare on a railroad goes for upkeep of track as well as rolling-stock. Similarly, taxes on motor vehicles must be used on the highways since these taxes provide the main source of income for improvement and upkeep.

Increasing the shortage of highways will have a most depressing effect on the automobile industry which is looked upon as one of the leaders in renewing industrial activity. Congestion on the highways which is so evident to everyone clearly shows that if more motor vehicles are to be manufactured, more roads must be built over which they can operate," Mr. Smith concluded.

SPEEDING FARM PRODUCTS

There are now some 90,000 miles of concrete pavement running through the rural areas of the United States. These pavements directly serve millions of farmers and enable farmers several miles from the main highways to get to distant and profitable markets in jig time after they leave the local roads.

fuse the reader. If shapes of arrow or letters seem slightly out of proportion, it should be remembered that they were designed primarily for night visibility.

The principles set forth above will undoubtedly be embodied within the near future in all warning signs on the more important State routes, as many accidents are directly attributable to insufficient warning, conveyed by the present plain signs. A survey has recently been completed in conjunction with representatives of the two automobile clubs looking toward this change.

Highway Bids and Awards for February

CALAVERAS COUNTY—Between 3.4 miles north of Angels Camp and 1.8 miles north of Angels Camp, about 1.6 miles to be graded and surfaced with crushed gravel or stone. Dist. X, Rt. 65, Sec. B, J. R. Reeves, Sacramento, \$38,893; Chas. N. Chittenden, Napa, \$32,199; Milton A. Purdy, San Francisco, \$34,256; James Edward Johnston, Stockton, \$30,251; A. Teichert & Son, Inc., Sacramento, \$27,913; Hemstreet & Bell, Marysville, \$26,220; Willard & Biasotti, Stockton, \$27,048; Skeels & Graham Co., Roseville, \$42,779; R. L. Oakley, Palo Alto, \$33,508; Fred W. Nighbert, Bakersfield, \$31,955; Force Construction Co., Piedmont, \$32,575; C. W. Wood, Stockton, \$29,358; Hein Bros.-Basalt Rock Co., Petaluma, \$32,423; Contoules Construction Co., San Francisco, \$30,130. Contract awarded to Larsen Bros., Galt, \$25,607.

HUMBOLDT COUNTY—Benbow Bridge approaches about 0.4 mile grade and treat with untreated crushed gravel or stone. Dist. I, Rt. 1, Sec. A, Hein Bros., Basalt Rock Co. and J. V. Galbraith, Petaluma, \$24,774.33; Peter McHugh, San Francisco, \$32,239.20; Hemstreet & Bell, Marysville, \$25,469.99; Larson Bros., Galt, \$24,382.60; Meyer Rosenberg, San Francisco, \$34,195.10; F. C. Coats, Sacramento, \$26,115.90; Milton A. Purdy, San Francisco, \$27,949.75; Chas. N. Chittenden, Napa, \$26,630.80; Force Construction Co., Piedmont, \$28,164.80; Contoules Construction Co., San Francisco, \$24,410.60. Contract awarded to Rocca & Caletti, San Rafael, \$23,278.75.

IMPERIAL COUNTY—Between El Centro and Calexico, about 10.1 miles, oil treated crushed gravel or stone borders. Dist. VIII, Rt. 26, Sec. J, V. R. Dennis Const. Co., \$36,810. Contract awarded to R. E. Hazard Construction Co., San Diego, \$33,687.

IMPERIAL COUNTY—Between 3 miles west of Coyote Wells and Dixieland, about 14.7 miles to be graded and paved with asphalt concrete. Dist. VIII, Rt. 12, Secs. A, B, H. W. Rohl Co., Los Angeles, \$426,933; George R. Curtis Paving Co., Los Angeles, \$526,885; R. E. Hazard Contracting Co., San Diego, \$463,445; Daley Corporation, San Diego, \$466,319; Geo. Herz & Co., Los Angeles, \$441,212; V. R. Dennis Construction Co., San Diego, \$436,463; Granite Construction Company, Ltd., Watsonville, \$439,839. Contract awarded to Griffith Co., Los Angeles, \$387,395.

LOS ANGELES COUNTY—Through Glendora, about 1.5 miles to be graded and paved with asphaltic concrete. Dist. VII, Rt. 9, Sec. H, Griffith Co., Los Angeles, \$52,956; P. J. Akmadzich, Los Angeles, \$62,474; Hall-Johnson Co., Alhambra, \$53,921. Contract awarded to Oswald Bros., Los Angeles, \$51,155.

LOS ANGELES COUNTY—Between Sepulveda Boulevard and Calabasas, about 10.4 miles to be graded and paved with Portland cement concrete. Dist. VII, Rt. 2, Secs. A, B, Basich Brothers, Torrance, \$170,265; Thomas C. Rogers, Monrovia, \$202,899; J. L. McClain, Los Angeles, \$166,205; Griffith Co., Los Angeles, \$169,109; Jahn & Bressi Construction Company, Inc., Los Angeles, \$189,723; McCray Co., Los Angeles, \$189,130; George R. Curtis Paving Co., Los Angeles, \$179,850; Ed. Johnson and Sons, Los Angeles, \$169,252; Gibbons & Reed Co., Burbank, \$189,823; Sander Pearson, Santa Monica, \$206,492; Southern California Roads Co., Los Angeles, \$174,810; Will F. Peck Co., Los Angeles, \$211,043. Contract awarded to Kovacevich & Price, Inc., South Gate, \$163,194.

ORANGE COUNTY—In Fullerton, about 1.9 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 2, Sec. F, L. A. Paving Co., Los Angeles, \$108,875.50; Hall-Johnson Co., Alhambra, \$102,671; Griffith Co., Los Angeles, \$95,328; Osborn Co., Pasadena, \$92,799. The Contract was awarded to Oswald Bros., Los Angeles, \$89,672.

PLACER COUNTY—Undergrade crossing under S. P. tracks near Towle, two concrete abutments with wing walls. Dist. III, Rt. 37, Sec. D, J. W. Terrill, Sacramento, \$19,928.50; Nelson Bros., Escalon, \$17,987.50; Lord and Bishop, Sacramento, \$18,485; C. W. Wood, Stockton, \$15,725; H. Sneed, Oakdale, \$20,703; Lang Transportation Co., Los Angeles, \$23,071; J. R. Reeves & O. G. Ritchie, Sacramento, \$21,073; B. A. Howkins & Co., San Francisco, \$16,810. Contract awarded to P. F. Bender, North Sacramento, \$16,380.50.

RIVERSIDE COUNTY—At the Santa Ana River

bridge at Riverside, grading and paving approaches. District VIII, Route 19, Sec. A, Pearson & Dickerson, Riverside, \$11,272; Hall-Johnson Co., Inc., San Bernardino, \$12,416; Byerts & Dunn, Los Angeles, \$11,113. Contract awarded to Byerts & Dunn, Los Angeles, \$11,113.

SAN BERNARDINO, RIVERSIDE AND IMPERIAL COUNTIES—About 570.8 miles of traffic stripe to be applied to pavement at various locations. Dist. VIII, Rts. 9, 12, 19, 26, 27, 31, 43, 58, 59, 64, 77, 78, Edwin Anderson, San Francisco, \$3,538; Essick & Co., Los Angeles, \$3,567; Kemper Construction Company, Ltd., Los Angeles, \$4,709. Contract awarded to B. G. Carroll, San Diego, \$3,019.

SAN BERNARDINO COUNTY—Through Upland about 2.2 miles in length furnishing and spreading fuel oil on shoulders. District VII, Rt. 9, Sec. D, Pacific Tank Lines, Inc., Los Angeles, \$1,087.20; Gilmore Oil Co., Ltd., Los Angeles, \$1,395; Paulsen & March, Inc., Los Angeles, \$1,331; Leonard C. Pulley, Long Beach. Contract awarded to Square Deal Oil Co., Inc., Los Angeles, \$1,023.

SAN DIEGO COUNTY—Between Sorrento Creek and Del Mar, about 0.8 mile long to be graded and paved with Portland cement concrete. Dist. VII, Rt. 2, Sec. A, Oberg Bros., Los Angeles, \$77,047.20; Frank Doran, San Diego, \$69,640.20; Macco Construction Co., Inc., Clearwater, \$76,490.60; Gist & Bell, Arcadia, \$78,158.10; C. R. Butterfield, San Pedro, \$66,218.10; Yglesias Bros., Inc., San Diego, \$73,655.50; Daley Corp., San Diego, \$72,158.20; Griffith Co., Los Angeles, \$79,946.30; V. R. Dennis Const. Co., San Diego, \$83,139.60; Jahn & Bressi Construction Co., Inc., Los Angeles, \$76,772; Basich Bros., Torrance, \$67,138.80. Contract awarded to C. R. Butterfield, San Pedro, \$66,218.10.

SANTA BARBARA COUNTY—Bridge across San Antonio Creek, 1 mile north Los Alamos 8-40' string beam spans with concrete deck on concrete pile bents and concrete abutments with wing walls on pile foundations. Dist. V, Rt. 2, Sec. M, Merritt-Chapman & Scott Corp., San Pedro, \$38,824; Theo. M. Maine, San Luis Obispo, \$37,400; Gist & Bell, Arcadia, \$36,479; Nead Const. Co., Wilmington, \$35,397; Oberg Bros., Los Angeles, \$39,403; M. J. Bevanda, Stockton, \$35,180; Lynch-Cannon Engineering Co., Los Angeles, \$41,693; Bodenhamer Const. Co., Oakland, \$35,725; Robinson-Roberts Co., Los Angeles, \$39,765; Neves & Harp, Santa Clara, \$36,790; M. B. McGowan, Inc., San Francisco, \$36,796.70. Contract awarded to Fredrickson & Watson Const. Co., & Fredrickson Bros., Oakland, \$34,260.

SANTA CLARA COUNTY—Between Union Avenue and Stephens Creek Road, about 3.4 miles to be graded and paved with Portland cement concrete and asphaltic concrete. Dist. IV, Rt. 5, Sec. B, Clark & Henery Construction Co., San Francisco, \$84,368; Valley Paving & Construction Co., Fresno, \$68,078; A. J. Raichs, San Jose, \$65,633; Heafey-Moore Co., Oakland, \$66,192. Contract awarded to Union Paving Co., San Francisco, \$62,637.

SISKIYOU COUNTY—Near Beaver Creek, about 3 1/2 miles west of Gottville, about 4 miles to be graded and surfaced with untreated crushed gravel or stone. Dist. 2, Rt. 46, Sec. D, A. Young, Yreka, \$16,772; Clarence Young, Oakland, \$17,598; J. P. Brennan, Redding, \$17,271.40; Chas. N. Chittenden, Napa, \$16,931.50; Dunn & Baker, Klamath Falls, \$24,506.10. Contract awarded to Milton A. Purdy, San Francisco, \$14,437.50.

SONOMA AND MENDOCINO COUNTIES—Between Cloverdale and Hopland, about 13.9 miles to be graded. Dist. IV, Rt. 1, Secs. D, L, T. E. Connolly, San Francisco, \$643,070; Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$543,910; The Utah Construction Co., San Francisco, \$661,611; A. Guthrie & Company, Inc., Portland, Oregon, \$745,698; Merritt-Chapman & Scott Corporation, San Pedro, \$554,555; George Pollock Co., Sacramento, \$596,023; Healy-Tibbitts Construction Co., and J. P. Holland, Inc., San Francisco, \$522,459; Kern & Kibbe, Portland, Oregon, \$580,322; MacDonald & Kahn Company, Ltd., San Francisco, \$591,299; Morrison-Knudsen Co., Los Angeles, \$640,565; Von der Hellen & Pierson, Castaic, \$541,417; Contoules Construction Co., and Schuler & McDonald, Inc., Oakland, \$652,946; A. Teichert & Son, Inc., Sacramento, \$672,282; E. C. Coats, Sacramento, \$590,919. Contract awarded to Granfield, Farrar & Carlin, San Francisco, \$463,264.

Ten Miles of Elm Trees Planted Along Golden State Highway

By W. A. SMITH, Assistant Maintenance Engineer

THERE is a continual interest taken by the public in roadside beautification. The most concrete evidence of that fact is shown by the tree planting projects which are undertaken each year—projects that are not financed by the State.

The individual or organization desiring the trees planted must pay for the original planting and for the upkeep cost for the first year.

This policy, adopted by the State in the early years of roadside planting, has been found a most necessary check on the over-enthusiasm of many worthy organizations. It insures that projects will be undertaken only after due consideration and with reasonable assurance that a worthwhile planting will develop.

The Division of Highways organization for its part advises as to the planting and, following the first year, assumes the entire expense of care of trees planted under its supervision.

POPULAR IN KERN

Kern County authorities long ago realized the advantages of such work. One of the early plantings on State highways was on the section of the Golden State Highway between Bakersfield and Grapevine Station.

Last year, trees were planted between the north county line near Delano to Famosa and this year some 550 Siberian elms were planted on the ten miles south of Famosa.

The State has participated in this work to the extent of shaping up the areas of the right of way as part of construction operations so that the trees could be planted in proper relation to the ultimate development of the roadway. In addition, the State forces have been filling in missing trees on sections south of Bakersfield. Some 200 Eucalyptus and Ash trees have been planted in this area.

TRYING PALO VERDE

In Imperial County, there is great interest in planting work and this season three trial plantings of Palo Verde trees are proposed to make sure how expensive the care of these trees will be under desert conditions.

The Lions Club of Yreka, Siskiyou County, recently planted thirteen black locust trees at the Pioneer Bridge north of Yreka. A plaque was placed at this structure when the bridge was dedicated to the pioneers last year and the planting will eventually make an attractive stopping place.

The Colusa Chamber of Commerce donated sufficient funds for the planting and care of fifty-four Chinese Elms on the Tahoe-Ukiah highway. The Women's Club of Williams, Colusa County, also donated funds for planting fifty trees between Williams and Arbuckle and eighteen trees on the Tahoe-Ukiah route west of Williams.

PLANTING CORK TREES

The Novato Chamber of Commerce has contributed funds for the planting of thirty-three Cork Oak trees on the Redwood Highway between that place and San Rafael.

In addition to the above plantings, the Division of Highways is replacing trees west of Tracy with

TWO QUESTIONS ANSWERED

The following letters asking information in regard to this publication are printed with answers for the purpose of answering similar questions that may be in the minds of other readers.

California Highways and Public Works,
Sacramento, Cal.

Gentlemen:

I have read several copies of the magazine you issue, "California Highways and Public Works." The booklet is very interesting and instructive to me as a native son, and would like to subscribe to the booklet.

I would appreciate a note in regard to the subscription rate as I see none listed in the booklet.

Thanking you,

HOWARD H. HART
c/o "Harthaven Ranch"
St. Helena, Napa County.

Editor's Note: There is no charge for California Highways and Public Works. It is mailed free to every citizen asking for it.

Colonel Walter E. Garrison,
Director of Public Works,
Sacramento, Cal.

I have just read the February issue of California Highways and Public Works and write to congratulate you, not only upon the splendid showing it presents of progress in the great highway and other State public works program, but on the publication itself.

The California Highway Program now showing real accomplishment, is magnificent. It is meeting with unstinted approval from people I meet everywhere throughout the State.

I am wondering how wide is the circulation of your department publication. It is one of the most interesting magazines which comes to my desk and I hope it is being made available to citizens everywhere.

Congratulations and best wishes on your fine work. Now if we can just get the water problem started, the picture will be complete.

JAMES M. BURKE
Visalia, California.

Editor's Note: This magazine is now being sent to some 9000 readers who have made requests for it.

Oleanders, as the heavy winds in that section prevent development of worthwhile trees.

On the Redwood Highway, some 2000 Toyons and Redwoods have been planted in Mendocino and Humboldt counties at abandoned portions of the old highway and on banks and fills as protection for the slopes to reduce maintenance.

A large amount of Ice plant has been planted on slopes in the San Francisco, San Luis Obispo and Los Angeles districts as protection work.

Twenty-five Departments Move in to New Los Angeles State Building

THE California State Building at Los Angeles has reached the stage of final completion permitting occupancy by many of the State departments that have been housed in rented quarters in private buildings.

The offices for a number of these departments have already been finished and present a busy moving day scene. It is expected that most of the departments will have been installed in this fine new building by April 1st, and that the end of April will see a completion of this imposing official migration of some 25 departmental division, bureaus and commissions.

In addition to these, the building will provide accommodations for the Supreme Appellate and Superior courts, quarters for the Governor and Lieutenant Governor, and a large assembly hall.

The disposition of the various State units is as follows:

FIRST FLOOR	FIFTH FLOOR
Division of Veterans Welfare	Compensation Insurance Fund
Division of Industrial Welfare	Division of Labor Statistics and Law Enforcement
Division of Athletics	Division of Housing and Sanitation
Superintendent's Office	
Franchise Tax Commissioner	SIXTH FLOOR
Department of Institutions	State Controller
Rehabilitation Bureau	Division of Industrial Accidents and Safety
Department of Education	
SECOND FLOOR	SEVENTH FLOOR
Division of Building and Loan Supervision	Railroad Commission
Division of Real Estate	Division of Banking
Department of Agriculture	Division of Fire Safety
	Department of Public Health
	Department of Social Welfare
THIRD FLOOR	EIGHTH FLOOR
Department of Penology	Department of Public Works
Department of Natural Resources	
Division of Fish and Game	NINTH FLOOR
Executive Offices	Department of Professional and Vocational Standards
Department of Finance	Inheritance Tax Appraisers
Board of Equalization	
FOURTH FLOOR	
Division of Corporations	

Division of Insurance
Attorney General

TENTH FLOOR

Courtrooms and Justice rooms

ELEVENTH FLOOR

Courtrooms and Justice rooms

TWELFTH FLOOR

Records and Clerks

THIRTEENTH FLOOR

Record Rooms

TWO WINGS ADDED

The history of the new building dates back to the Legislature of 1925 which passed an act later ratified by the people at a general election in November, 1926, authorizing a bond issue including \$1,250,000 for the construction and equipment of a State Office Building in the city of Los Angeles. Subsequently an additional sum of \$607,350 was appropriated by the 1931 Legislature to construct two additional wings made necessary by insistent demands for additional space.

The deed to the State for the portion of the site required for the actual building was finally executed in March, 1930. Mr. John C. Austin, architect of Los Angeles, was commissioned to prepare plans for the building on March 9, 1930, and contracts for its construction were entered into in October, 1930.

This property was deeded to the State free of cost by the county of Los Angeles and will be a part of the new Civic Center.

CIVIC CENTER UNIT

The building is located exactly in accordance with the comprehensive plan for the Civic Center which was adopted two years ago by the city and county governments. The architectural style of the building is in harmony with that of all of the other new buildings erected in the Civic Center notably the City Hall and Hall of Justice. The State therefore is conforming to the approved Civic Center scheme in every particular.

There will be other buildings erected before the Civic Center is complete among them the new County Court House, possibly a civic auditorium, a new Federal Building and a Health Center Building. The State made the contribution of its own building at a most opportune time in view of present unemployment conditions.



MONUMENTAL IN CHARACTER, this recently completed California State Building in Los Angeles is now being occupied by numerous departments of the State government hitherto located in rented quarters at an annual expense to the State of \$85,000. It is of Class A construction, thirteen stories high, built of reinforced concrete, structural steel, granite and terra cotta at a total cost of \$1,857,350. With its two wings it provides 135,000 square feet of floor space.

PAYING \$85,000 RENTALS

The imperative need for the building grows out of the fact that the State has been paying rentals for very inefficient office space in Los Angeles of approximately \$85,000 annually. The building will just about supply the present needs for floor space.

It is significant that approximately all of the material for the building except the structural steel was obtained in California and the fabrication of the structural steel was done in the city of Los Angeles.

The State Building is monumental in character, of reinforced concrete, structural steel, granite and terra cotta, Class "A" in construction and 13 stories high. There is about 135,000 square feet of floor space in the building.

The total number of motor trucks in use in the United States last year was 3,490,000.

The National Safety Council reports that trucks, buses, taxicabs and other commercial vehicles involved in fatal accidents decreased 31 per cent during the past four years while during the same period the number of private cars involved in fatal accidents increased 59 per cent.

Providing for Heavy Coast Traffic

(Continued from page 14)

about 1.3 miles, but will necessitate the building of four bridges.

Another unit in the construction of the Ridge Route Alternate in Los Angeles County will be put under way with the advertising for bids on the construction of three of the proposed seven bridges in this 27-mile revision of the central artery of the State highway system. Two of these three structures will be placed across Los Alamos Creek and the third will span Gorman Creek.

The bridge across Gorman Creek will be reinforced concrete of four 15-foot spans and the two across Los Alamos Creek will be three span steel beams on concrete piers, one bridge to be 128 feet long and the other 220 feet long.

This new alignment of the heavily traveled Los Angeles-Sacramento artery across the Tehachapi follows the canyon to the west of the existing tortuous climb over the Ridge Route and will not only facilitate travel on this important route by presenting modern alignment and grade but will shorten the distance by nearly 10 miles.

COAST IMPROVEMENTS

Improvement to the Oxnard-Serra Highway, sometimes called the Coast Boulevard, which skirts the Pacific from Oxnard in Ventura County to Serra, just south of San Juan Capistrano in Orange County, will be advanced by the advertising of four projects. The 2.4 miles westerly from Santa Monica to Santa Ynez Canyon (Beverly Boulevard) is to be reconstructed and paved with a 40-foot asphalt concrete pavement and the roadbed constructed to a width of 76 feet.

This work involves straightening of the alignment—the minimum radius for curves on the new construction to be 1200 feet against 250 feet on the existing road—and the maximum grade at Beverly Boulevard will be reduced from 4 per cent to 1 per cent. This portion of the Coast Boulevard lies between high cliffs and a narrow beach and in connection with its reconstruction a project is to be advertised for building timber and steel sheet piling groynes along portions of the beach to build up the beach and keep the ocean back from the roadbed.

The other two projects on the Coast Route are located towards its southerly end. The one involves the placing of a 40-foot Portland cement concrete pavement on an 80-foot roadbed between Newport Beach and Corona del Mar. This 4.8 miles of new highway will connect the recently widened pavement from Long Beach to Newport Beach with the pavement now under construction between Corona del Mar and Laguna Beach.

HEAVIEST TRAFFIC

The fourth project will carry the Portland cement concrete pavement southerly from Laguna Beach to Dana Point where it will connect with the short strip of pavement placed three years ago between Dana Point and Serra on the Coast Route.

This highway along the southern California coast carries the heaviest traffic of any of the arterials of the State system and its improvement to super-highway standards is being rapidly advanced so that motorists will have ready access

to any one of the popular beaches which lie along the route.

Two projects in Riverside County planned for March advertising are on the El Centro-San Bernardino lateral, the chief connecting link between the fertile Imperial Valley and metropolitan Los Angeles. This lateral carries a large volume of produce trucking and commercial traffic. The two projects involve the reconstruction of 14.3 miles of this route to modern standards, with a 20-foot Portland cement concrete pavement, from the Imperial County line to Avenue 62. One of the projects is to extend from the county line to Avenue 74 and the other from Avenue 74 to Avenue 62 and they will complete the modern pavement on this route from El Centro to San Bernardino with the exception of some 15 miles of 16-foot paving between Whitewater and Banning.

RAISES GRADE

The 14-mile improvement will rectify alignment, eliminate the dips and raise the grade, making ample provision for proper drainage. The southerly end of this stretch of highway will connect with the new asphalt concrete pavement recently placed between the Arroyo Salado and the Imperial-Riverside County line.

Carrying out the general scheme of modernization for the important San Diego-El Centro lateral, another section is to be reconstructed covering the 7.5 miles between Bostonia and Chocolate Creek in San Diego County. The proposed work will straighten alignment, improve the grade and provide a 20-foot Portland cement concrete pavement on a standard 36-foot roadbed. This section of the existing road is a crooked one with sustained 7 per cent grades and a pavement only 15 feet wide on a roadbed about 24 feet wide. The present improvement will make many line changes with entirely new pavement and on the remainder of the project the existing roadbed and pavement will be widened. The project will begin at the easterly end of the recently completed Bostonia line change and extend to 3.5 miles west of Alpine.

ARCHITECTURAL AWARDS

For Month of February

Fresno State Teachers College—Library Building—Contract for general work to H. Mayson, Los Angeles, \$123,953; heating and ventilating to Thos. Havery Co., Los Angeles, \$14,759; electrical to Guilbert Bros. Elec. Co., San Jose, \$16,300; plumbing to J. A. Fazio, Oakland, \$3,230.

Armory, Pasadena—For California National Guard—Contract for general work to Edwin G. Bowen Company, Ltd., \$32,050; plumbing and heating to Thos. Havery Co., Los Angeles, \$3,563; electrical to R. R. Jones Elec. Co., South Pasadena, \$1,799.

Patton State Hospital—Drilling and testing water well awarded to Roscoe Moss Company, Los Angeles, \$6,570.

The oldest motorist in the United States recently passed a test for his automobile driver's license in Michigan. He is Thomas Gordon, 102 years old of Grand Rapids. Gordon never has had an automobile accident in many years of driving. His maxim is: "Always watch the other fellow no matter who has the right of way."



In addition to action taken by the California Districts Securities Commission on several important matters, State Engineer Hyatt's report for February tells of approval of plans from Los Angeles County for San Gabriel Dam No. 2, 240 feet in height and application by that county for approval of plans for Dam No. 1, 300 feet in height to store 64,000 acre-feet. Salinity has receded from practically all San Joaquin-Sacramento delta points. Precipitation reports indicate a high percentage above normal in all water basins of the State with no floods of magnitude except in Salinas Valley where floods exceed any records for the past fifteen or twenty years.

Other important matters are dealt with in the report as follows:

Bulletin 18-B, a revision of California irrigation district laws to 1931, published by the Department, has been completed and is now available. The bulletin contains the full text, as amended, of the following acts: Irrigation district, water storage district, water conservation district, California water district, county district; also the district securities commission act, and other general provisions affecting organizations under the various acts.

In connection with securing information desired by this office and required by the Districts Securities Commission the following districts were visited: West Side, Naglee-Burke, Tracy-Clover and Banta-Carbona irrigation districts, San Joaquin County; Cordua Irrigation District, Yuba County; Anderson-Cottonwood Irrigation District, Shasta County; and El Camino Irrigation District, Tehama County. At the request of landowners, an inspection was made of the Rio Oso section, south of Bear River, in Sutter County, for the purpose of assisting in obtaining an additional water supply for the orchards in that section. The present source of supply from wells is apparently being overdrawn.

SECURITIES COMMISSION MEETING

The regular monthly meeting of the California Districts Securities Commission was held in the offices of the Commission, State Building, San Francisco, on February 11, 1932. Consideration was given and action taken on the following matters:

Scott Valley Irrigation District.—Approval for exchange of \$69,000 face value of refunding bonds for an equal amount of outstanding bonds of the district.

Modesto Irrigation District.—Granted permission to destroy \$236,000 par value of unsold bonds of the 14th issue.

Lindsay-Strathmore Irrigation District.—Authorized to enter into contract for the purchase of one share of Wutchumne Water Company stock for \$7,000, and for the purchase of 44 shares of Consolidated Peoples Ditch Company stock for \$2,540.

At a special meeting of the Commission held in San Francisco on February 18, approval was given to the plan presented by the directors of the Palmdale Irrigation District for refunding the outstanding bonds of the district in amount of \$445,000.

DAMS

To date 791 applications have been received for approval of dams built prior to August 14, 1929; 93 for approval of plans for construction or enlargement and 237 for repairs or alterations.

Applications Received for Approval of Plans for Construction or Enlargement.

Dam	Owner	County
San Gabriel No. 1	Los Angeles Co. Fld. Con. Dist.	Los Angeles
Lindo Lake	County of San Diego	San Diego
Antioch	Town of Antioch	Contra Costa
Unnamed	Santa Catalina Island Co.	Los Angeles

The San Gabriel No. 1 Dam is to be a rockfill structure 300 feet in height from streambed to spillway crest and having a storage capacity of 64,000 acre-feet. It will be situated in the San Gabriel Canyon about two miles below the Forks of the Canyon.

Applications Received for Approval of Plans for Repair or Alteration.

Dam	Owner	County
Tinemaha	City of Los Angeles	Inyo
Lake Wyandotte	Oroville-Wyandotte Irr. Dist.	Butte
Medley Lakes	Pacific Gas & Electric Co.	El Dorado
Finnon	Pacific Gas & Electric Co.	El Dorado
Mill Creek	Crast Counties Gas & Elec. Co.	Santa Cruz
Millbrae No. 1	Mills Estate, Inc.	San Mateo

Plans were approved for the construction of the San Gabriel No. 2 Dam which is to be a rock fill dam about eight miles up the west fork of the San Gabriel Canyon from the Forks. It will be 240 feet in height and store 14,000 acre-feet of water, to be built by the Los Angeles County Flood Control District.

Plans Approved for Repairs or Alterations.

Dam	Owner	County
Upper St. Helena	Town of St. Helena	Napa
Cowell	Henry Cowell Lime & Cement Co.	San Mateo
Tinemaha	City of Los Angeles	Inyo
Taylor Lake	J. L. Robinson	Plumas
Lake Wyandotte	Oroville-Wyandotte Irr. Dist.	Butte

Protective Work to Start in South

(Continued from preceding page)

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During the period work has been continued on maintenance clearing in the Butte Slough By-pass. On February 6 the clearing crew of 80 men was decreased to 30, and at this date the work is practically complete. A total of \$22,000 has been expended on maintenance clearing work this season.

Construction has proceeded on the maintenance headquarters near Sutter City. It is expected that the buildings will be so far completed by March 1 that our property may be removed from the four places now being rented.

The drainage pumping plants on the Sutter By-pass have been operated during parts of this period.

Sacramento Flood Control Project.

The Reclamation Board has made available for construction clearing in the Tisdale and Sutter-Butte By-passes the sum of \$5,600, primarily to aid the unemployed in Sutter and Yuba counties. A crew of 70 men will be employed at once.

Emergency Flood Protection and Rectification of Rivers.

Channel clearing on the Santa Ynez River near Lompoc in cooperation with the county of Santa Barbara has been completed.

Arrangements have been made for rectification and protective works on Bautista Wash, a tributary of the San Jacinto River, in cooperation with Riverside County and landowners, to cost \$1,500, on which work will commence next week.

River rectification work on the San Jacinto River has been completed.

Sacramento Flood Control Project—Bank Protection.

Tentative arrangements have been made for bank protection work in cooperation with Reclamation District No. 730 at Russell Bend, at a cost of approximately \$3,000.

Very little cooperative bank protection work has been carried out on the Sacramento River and its tributaries this season, no work now being under way. This is due to the financial condition of the various districts, although there are a number of places requiring attention. There are no places, however, in such critical condition that breaks are certain to occur in high water. This Division is ready to act promptly in rendering temporary protection should an emergency arise at any of these places.

Pajaro River.

Two small levee jobs have been completed on the Pajaro River near Watsonville, under Chapter 524, Statutes of 1929. This work was made necessary by the damage caused by the flood in December.

Russian River Jetty.

Work has proceeded in making repairs to the steel trestle and track from the quarry damaged by the storms last December, at which time damage estimated at \$7,000 was caused. No additional rock has been hauled into the jetty during this period.

Flood Measurements and Gages.

During this period certain streams in the valley reached stages at which discharge measurements were required, and measurements were made at the following points:

American River, Middle Fork, near Auburn.
Cosumnes River and Badger Creek, near Arno.
San Joaquin River, near Vernalis.
San Joaquin River, at Mossdale Bridge.
San Joaquin River, at Paradise Cut.
American River, at Rattlesnake Bridge.

WATER RIGHTS

Applications to Appropriate.

During the month of January, 18 applications were received to appropriate water, 6 were denied and 12 were approved.

Among the more important applications received were three for mining purposes; one being by C. H. Barkdull of Seattle, Washington, proposing an appropriation of 50 cubic feet per second from Mosquito, Ammon, and Bear Trap creeks and other tributaries of the South Fork of Trinity River; and the other two being by the Spanish Mining Company of San Francisco, proposing appropriations from Devil's Canyon Creek and Poorman's Creek, tributaries of the South Fork of Yuba River, at an estimated cost of \$17,000.

Among the applications approved were five by George N. Keyston and William F. Leib of San Francisco proposing appropriations from El Corte Madera Creek and Tunitas Creek in San Mateo County at an estimated cost of \$160,000, for irrigation and domestic uses of a subdivision.

A very good response has been received to the requests for reports of progress on the part of permittees and licensees, some 1500 of these reports having been received during the past three months.

ADJUDICATIONS

North Cow Creek (Shasta County). A decree defining the water rights on North Cow Creek, based upon the amended stipulation for judgment heretofore signed by all parties, is being prepared by the Division upon request of the Superior Court of Shasta County. The decree will issue at an early date.

Clover Creek (Shasta County). The hearing on the Clover Creek case before the Superior Court of Shasta County has been postponed indefinitely pending negotiations for settlement by stipulation.

Deep Creek (Modoc County) The Division's report covering the distribution of the waters of Deep Creek, in accordance with the trial schedule of allotments adopted for the 1931 season, is being circulated among the interested parties prior to a conference to be held with the water users on March 15, 1932.

Franklin Creek (Modoc County). A stipulation for consent judgment has been prepared and will be submitted to the water users at a conference to be held at Alturas on March 14, 1932.

Precipitation Shown Far Above Normal

(Continued from preceding page)

New Pine Creek (Modoc County). A stipulation for consent judgment has been prepared and will be submitted to the water users at a conference to be held at New Pine Creek on March 16, 1932.

Eagle Creek (Modoc County). The report on the water supply and use of water on Eagle Creek has been circulated among the interested parties and a schedule for trial distribution of the waters of the stream for the 1932 irrigation season will be submitted to the water users at a conference to be held at Eagleville on March 15, 1932.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The work on this project during the past month has been chiefly in preparation of the 1931 annual report which will furnish the results of all measurements of diversions, stream flow, return flow, use of water, salinity, etc., for the Sacramento-San Joaquin territory. The work has continued on the special report of damage and crop losses in 1931 due to salinity and water shortage.

Routine maintenance of tide gages and salinity stations has continued. With the increased river flow due to recent storms, the salinity has receded from practically all delta points and on February 1st, the number of sampling stations was cut to nineteen. The sampling is permanently maintained throughout the year at this number of stations as well as at six stations where drainage water is sampled. A comparison of the salinity on January 10th and February 10, 1932, is shown in the following:

SALINITY—SACRAMENTO-SAN JOAQUIN DELTA

Station	Parts of Chlorine per 100,000	
	1 10 32	2/10/32
Bullshead	110	40
Bay Point	15	7
O. and A. Ferry	10	3
Collinsville	8	3
Antioch	11	6
Emmaton	4	3
Jersey	13*	6
Central Landing	3	4
Middle River P. O.	5	8

* January 18th

COOPERATIVE SNOW SURVEYS

Under the arrangements between the State and various cooperating agencies, the monthly surveys at key snow courses throughout the State were completed in the latter part of January and the results reported in the February 1st bulletin of Snow Survey and Precipitation Data. The bulletin reported as well all available data to February 1st from the precipitation stations of the State, districts, public utilities, and U. S. Weather Bureau in the foothill and mountainous regions of the various stream basins.

In general, the surveys indicated a water content of the snow on February 1st of this year exceeding

that on February 1st of last year by from three to four times from the Upper Sacramento to the Stanislaus Basin (except Mt. Shasta snow course which showed only 1.4 times); from two and one-half to three and one-half times in the Merced and Tuolumne basins; about four times as an average in the San Joaquin and Mono basins; from three to five times in the Kings, Kaweah and Kern basins; and anywhere from three to nine times in the Owens Valley drainages. Of four crest snow courses for which the period of record has permitted the development of normals, three, consisting of Blue Lakes on the Mokelumne-Carson divide, Rhinedollar Lake close to the Tuolumne-Mono divide, and Mammoth Pass on the San Joaquin-Owens divide, indicated a water content on February 1st amounting to between 80 and 85 per cent of the normal water content to be expected for the entire season (up to April 1st). The corresponding percentage indicated by the fourth course, Summit, on the Yuba-Truckee divide, was 116 per cent.

The data from the precipitation stations indicated, in general, that the precipitation on February 1st, was between normal and 10 per cent above normal in the Upper Sacramento, Pit, McCloud and Feather River basins; from 15 to 25 per cent above normal in the basins from Yuba to Stanislaus; between 40 and 50 per cent above normal from the Tuolumne to Kings basins; from 55 to 65 per cent above in the Kaweah and Kern basins; and from 40 to 60, with a general average of about 50 per cent above normal in the Los Angeles, San Gabriel and Santa Ana basins. Single stations in the Owens and Walker basins indicate a precipitation to February 1st of 69 and 106 per cent, respectively, above normal, and a general average of 30 per cent above normal was indicated for the Tahoe-Truckee Basin. A general average for the percentage above normal of precipitation to February 1st from the Sacramento to the Kern basins was estimated at about 35 per cent.

WATER RESOURCES

South Coastal Basin, Mojave, Ventura County and Salinas Valley Investigations.—The South Coastal Basin Investigation has continued in a routine way during the past month as have also the Mojave, Ventura County and Salinas Valley Investigations. In all of these areas there has been more than normal rainfall but this has not caused floods of magnitude in any but the Salinas Valley. In this valley severe floods have occurred, greater than anything for the past 15 or perhaps 20 years. The situation is such in all of these investigations that especially valuable data have been gathered which will enable a more conclusive report to be made than would have been the case had an ordinary season prevailed.

Pit River Investigation (Modoc and Lassen counties).—The report covering the three years investigation of the Pit River, October 1, 1928 to October 1, 1931, is approximately 85 per cent complete.

Santa Clara Investigation.—The copious rains which have occurred during January permitted further measurements at the points where streams were debouching into the Santa Clara Valley.

Snow Surveyors Lost on Ski Trip in Kings River Wilds Win Through Perils

By S. M. MUNSON, Assistant Snow Supervisor

A RECENT snow trip into Big Meadows and Horse Corral Meadows on the South Fork of the Kings River proved eventful for the members of a survey party of the Division of Water Resources.



PUZZLE PICTURE—Find the cabin. That round black object just sticking out of snow is the chimney and the roof is some feet below the ski party eager to "hole in."

The men left Sacramento on Friday, February 12th, and abandoned their car for skis and heavy packs at 10 p.m., six miles beyond Badger, which is out from Visalia. The start was made and the first night's camp pitched in the open three uphill miles from the car.

Next morning, progress was retarded by a persistent snow storm, so after five miles of uphill going, the party "holed in" at a cabin in the Whitaker Redwood Forest.

CAUGHT IN STORM

The following morning all members were out at 4.30 a.m. for the hard 10-mile climb to Big Meadows. The trip to the top of the hill, nine of the ten miles, was traveled successfully, but Old Man Winter had blanketed everything so thoroughly at the top, that the road and all landmarks were completely obliterated.

Nothing remained but white expanse in wooded country and a telephone line which

should have led to Big Meadows but didn't. The party followed this line for over three miles before realizing definitely that they were off the route.

It was then 3 p.m., foggy, and snowing. Considerable elevation had been lost and skiing made increasingly difficult by the falling snow. However, a course was laid out on the map and followed by compass over hills and down and up ravines until finally, at 10 p.m., the party arrived in Big Meadows, no one knew where.

CAMPED IN SNOW

No cabins of any description could be found, so a fire was started in the snow beneath a group of tamaracks. It afforded some degree of warmth and hot soup was made and eagerly consumed before the fire sank into the snow and disappeared. Luckily, the skies cleared about this time, bringing moonlight and zero temperature.

It was necessary to keep moving in order to keep warm. The party started off along the northwestern edge of the meadow and



TYPICAL SNOW COURSE showing sampling tube and scales. The scales record water content of snow in tube. In foreground is surveyor's dog companion and heavy pack.

finally discovered the peak of a Forest Service cabin just visible above the snow.

It was necessary to remove part of the gable before the men could get inside, but

Snow Covered Cabin Only Accessible via Peak of the Roof

(Continued from preceding page)

what a sight greeted them when they finally gained admission! A cheering ensemble of wood, stove, and bed springs, made it all worth while. Dinner was cooked and the long day ended at 2.30 a.m.

Monday was bright and clear and after some exploring, the Big Meadows snow survey cabin was found within a mile of the previous night's refuge. The cabin was dug out and the work accomplished at the snow course.

TOUGH TEN MILES

The 10-mile trip to Horse Corral Meadow via Boulder was made on Tuesday over all varieties of snow from powdery to wind-crusts. Several more or less spectacular tumbles were blamed on these conditions.

In order to reach Horse Corral, it was necessary to drop some 1100 feet into Boulder Creek Canyon. The opposite wall was steep and icy and the ascent was only possible by using rope ski socks and "side-stepping."

This is good exercise and guaranteed to produce an appetite for any kind of cooking, which was just as well, as shown later. On the party's arrival at Horse Corral, the cabin was found to be nothing more than a mound of snow. It was impossible to get a proper draft through the stove pipe, so the cooking had to be done in the open fireplace a la Colonial Dames. After the morning's experience, the food, although flavored with smoke and ashes, was enthusiastically received.

COMPLETED SURVEY

The survey at the Horse Corral snow course was completed and the return trip to Big Meadows made on Wednesday. On the following day, the party had an excellent ski down hill to the car, getting some good practice in making Telemark turns.

The night was spent at the State unemployment camp at Pinehurst. The organization of the men and their system of self-government proved very interesting and the party enjoyed three of their substantial meals.

A bumpy trip over four feet of tractor-packed snow from Pinehurst to General Grant National Park was made on Friday. The snow course there was surveyed and the party returned to Sacramento the same day.

When It's Hard to Keep Straight



SIDESTEPPING AN ART at which the ski runners of the Division of Water Resources must become proficient to negotiate mountain sides in their snow course work.

Gasoline Sales Show Effect of Good Roads

An indication of the influence of good roads on the increased volume of automobile travel is provided by the fact that the annual gasoline consumption by motorists is four times greater now than it was ten years ago, it is pointed out by the California State Automobile Association. The increase has been steady and the gasoline consumed last year by motor vehicles was more than 15,000,000,000 gallons.

While the number of automobiles in the United States has increased $2\frac{1}{2}$ times during the past decade, the use of gasoline has quadrupled and this fact is generally attributed to the extensive growth of good roads.

A tourist was enjoying the wonders of California as pointed out by a native.

"What a beautiful grapefruit!" he said, as they passed through a grove of citrus trees.

"Oh, those lemons are a bit small, owing to a comparatively bad season," explained the Californian.

"And what are those enormous blossoms?" asked the tourist.

"Just a patch of dandelions," said the Californian. Presently they reached the Sacramento River.

"Ah," said the tourist, grasping the idea, "somebody's radiator is leaking!"

February Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of February, 1932.

INYO COUNTY—Application 7183. Mrs. Ruth F. Sherman, 459 N. Orange Drive, Los Angeles, for 200 gallons per day from Bishop Creek tributary to Owens River to be diverted in Sec. 32, T. 8 S., R. 31 E., M. D. B. and M., for domestic purposes.

FRESNO COUNTY—Application 7184. Division of Fish and Game, Department of Natural Resources, State of California, 510 Russ Bldg., San Francisco, for 3.0 c.f.s. and 20 acre-feet per annum from San Joaquin River tributary to San Francisco Bay to be diverted in Sec. 7, T. 11 S., R. 21 E., M. D. B. and M., for recreational (fish culture) purposes.

EL DORADO COUNTY—Application 7185. B. W. Stone, 161 Ellis Street, San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River; (2) Pilot Creek; (3) Gerle Creek; (4) Loon-Lake; (5) Buck Island Lake; (6) Rock Bound Lake; (7) Little South Fork Rubicon River tributary to American River drainage area, to be diverted in Sec. 9, T. 13 N., R. 16 E., M. D. B. and M., Sec. 11, T. 12 N., R. 12 E., M. D. B. and M., Sec. 24, T. 13 N., R. 13 E., M. D. B. and M., Secs. 1, 31, and 34, T. 14 N., R. 14 E., M. D. B. and M., Sec. 4, T. 13 N., R. 15 E., M. D. B. and M., Sec. 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

PLACER COUNTY—Application 7186. Robert D. Nicol and C. M. Carter, c/o C. M. Carter, 2325 Valley St., Oakland, for (1) 2.0 c.f.s. and (2) 600 and (3) 230 and (4) 4100 acre-feet per annum from (1) Big Granite Creek (2) East Fork Little Granite Creek (3) West Fork Little Granite Creek and (4) Big Valley Creek tributary to North Fork American River to be diverted in Sec. (1) 14 (2) and (3) 9 (4) 18, T. 16 N., R. 13 E., M. D. B. and M., for power and domestic purposes (490 h.p.), estimated cost \$500,000.

INYO COUNTY—Application 7187. Mrs. Mary Wilshire, 6707 Milner Road, Hollywood, for 400 gallons per day from Bishop Creek tributary to Owens River to be diverted in Sec. 29, T. 8 S., R. 31 E., M. D. B. and M., for domestic purposes. Estimated cost \$42.

TRINITY COUNTY—Application 7188. James G. King, Del Loma, for 2.0 c.f.s. from Canadian Creek tributary to Trinity River to be diverted in Sec. 26, T. 5 N., R. 7 E., H. B. and M., for irrigation and domestic purposes (75 acres). Estimated cost \$1,000.

SIERRA COUNTY—Application 7189. J. K. Latta, c/o R. F. Taylor, Downieville, for 0.5 c.f.s. from unnamed ravine tributary to N. Fork Yuba River to be diverted in Sec. 6, T. 19 N., R. 10 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$200.

TRINITY COUNTY—Application 7190. French Bar Mining Co., Del Loma, for 10 c.f.s. from Big French Creek tributary to Trinity River to be diverted in Sec. 29, T. 5 N., R. 8 E., M. D. B. and M., for mining and domestic purposes.

BUTTE COUNTY—Application 7191. E. K. Davis, 2818 S. Normandie Avenue, Los Angeles, for 65 c.f.s. from South Fork Feather River tributary to Sacramento River to be diverted in Sec. 33 or 34, T. 20 N., R. 6 E., M. D. B. and M., for power purposes (740 h.p.). Estimated cost \$2,500.

BUTTE COUNTY—Application 7192. Shelley F. Lee, Box C, Biggs, for 3 c.f.s. from Main South Canal of Reclamation District No. 100 tributary to Butte Creek and Sacramento River to be diverted in Sec. 14, T. 18 N., R. 1 E., M. D. B. and M., for irrigation purposes (149 acres). Estimated cost \$3,000.

CONTRA COSTA COUNTY—Application 7193. Bruno H. Gelbke, Concord, Contra Costa County, for 0.31 c.f.s. from Walnut Creek tributary to Suisun Bay to be diverted in Sec. 2, T. 1 N., R. 2 W., M. D. B. and M., for irrigation and domestic purposes (25 acres). Estimated cost \$1,000.

SOLANO COUNTY—Application 7194. James McNulty Estate, c/o Lola Dodini, R. F. D. No. 1, Box 26, Suisun, for 0.87 c.f.s. from Ledgewood Creek tributary to Suisun Bay to be diverted in Sec. 8, T. 5 N., R. 2 W., M. D. B. and M., for irrigation purposes (70 acres).

SAN DIEGO COUNTY—Application 7195. South Coast Land Co., a corporation, c/o Geo. O. Bauwens, consulting engineer, 112 Corona Avenue, Long Beach, for 1.50 c.f.s. from Agua Tibia Creek tributary to San Luis Rey River to be diverted in Sec. 31, T. 9 S., R. 1 W., S. B. B. and M., for irrigation and domestic purposes (120 acres). Estimated cost \$1,250.

AMADOR COUNTY—Application 7196. United States, El Dorado National Forest, Placerville, for 0.22 c.f.s. from unnamed spring at head of Silver Fork tributary to S. Fork American River to be diverted in Sec. 28, T. 10 N., R. 17 E., M. D. B. and M., for domestic purposes. Estimated cost \$600.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of February, 1932.

SANTA CLARA COUNTY—Permit 3850, Application 6653. Mrs. A. F. Cochrane, Morgan Hill, Santa Clara County, February 1, 1932, for 0.64 c.f.s. from Coyote River tributary to San Francisco Bay in Sec. 11, T. 9 S., R. 3 E., M. D. B. and M., for irrigation purposes on 51 acres of orchard.

SANTA CLARA COUNTY—Permit 3851, Application 6654. Mrs. A. F. Cochrane, Morgan Hill, Santa Clara County, February 1, 1932, for 0.025 c.f.s. from Coyote River tributary to San Francisco Bay in Sec. 11, T. 9 S., R. 3 E., M. D. B. and M., for domestic purposes. Estimated cost \$250.

SANTA CLARA COUNTY—Permit 3852, Application 6655. Mrs. A. F. Cochrane, Morgan Hill, Santa Clara County, February 1, 1932, for 0.22 c.f.s. from Coyote River tributary to San Francisco Bay in Sec. 13, T. 9 S., R. 3 E., M. D. B. and M., for irrigation of 18 acres of alfalfa. Estimated cost \$1,500.

SANTA CLARA COUNTY—Permit 3853, Application 6656. Mrs. A. F. Cochrane, Morgan Hill, Santa Clara County, February 1, 1932, for 0.12 c.f.s. from Coyote River tributary to San Francisco Bay in Sec. 11, T. 9 S., R. 3 E., M. D. B. and M., for irrigation of 9½ acres of alfalfa.

MONO COUNTY—Permit 3854, Application 6826. Dr. J. A. Jeffery, c/o Preston & Brautcht, 309 Bank of America Bldg., Merced, February 4, 1932, for 1.00 c.f.s. from well in Milner Creek tributary to Hammil Valley & Owens River in Sec. 15, T. 4 S., R. 33 E., M. D. B. and M., for irrigation of 720 acres. Estimated cost \$2,500.

PLACER COUNTY—Permit 3855, Application 7096. Carrie A. Gladding, Lincoln, Placer County, February 10, 1932, for 3.00 c.f.s. from Coon Creek (No. 1 and No. 2) tributary to Feather River in Sec. 22, T. 13 N., R. 6 E., M. D. B. and M., for domestic purposes and irrigation of 740 acres (200 acres alfalfa and 540 acres of general crops). Estimated cost \$2,000.

INYO COUNTY—Permit 3856, Application 7131. Panyo Gold, Ltd., 427 S. McCadden Place, Los Angeles, February 10, 1932, for 1.00 c.f.s. from Jail Canyon Stream tributary to Panamint Desert in Sec. 14, T. 20 S., R. 44 E., M. D. B. and M., for mining, milling and domestic purposes. Estimated cost \$575.

SAN JOAQUIN COUNTY—Permit 3857, Application 7124. Hunt Bros. Packing Co., San Francisco, February 13, 1932, for 3.9 c.f.s. from Mormon Slough in Sec. 7, T. 2 N., R. 9 E., M. D. B. and M., for irrigation of 313.5 acres. Estimated cost \$5,000.

NEVADA COUNTY—Permit 3858, Application 6935. Central Pacific Railway Co., San Francisco, February 13, 1932, for 1.5 c.f.s. and 140 acre-feet from Donner Creek in Sec. 16, T. 17 N., R. 16 E., M. D. B. and M., for industrial and domestic use at railroad yards in Truckee. Estimated cost \$30,000.

SIERRA COUNTY—Permit 3859, Application 7120. Walter Hayter, Camptonsville, February 18, 1932, for 3 c.f.s. from Big Humburg Creek in Sec. 15, T. 19 N., R. 9 E., M. D. B. and M., for mining and domestic use in Secs. 16 and 17, T. 19 N., R. 9 E., M. D. B. and M. Estimated cost \$1,500.

VENTURA COUNTY—Permit 3860, Application 7089. Evelyn Akin Robertson (P. O. Box 997), Ventura, February 25, 1932, for 0.35 c.f.s. from unnamed spring tributary to Cuyama River in Sec. 12, T. 7 N., R. 24 W., S. B. B. and M., for irrigation and domestic purposes on 20 acres. Estimated cost \$300.

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of February, 1932.

AMADOR COUNTY—Moore Mine Dam No. 479. Central Land and Trust Company, Patterson, owner; slab and buttress, 20 feet above streambed with a storage capacity of $\frac{1}{2}$ acre-feet, situated on unnamed stream tributary to Jackson Creek in Sec. 27, T. 6 N., R. 11 E., M. D. B. and M.

Applications for approval of plans and specifications for construction or enlargement of dams filed with the State Department of Public Works, Division of Water Resources, during the month of February, 1932.

LOS ANGELES COUNTY—San Gabriel No. 1 Dam No. 32-19. Los Angeles County Flood Control District, Los Angeles, owner; rockfill, 300 feet above streambed with a storage capacity of 64,000 acre-feet, situated on San Gabriel River in Sec. 6, T. 1 N., R. 9 W., S. B. B. and M., for storage purposes, for flood control use. Estimated cost \$5,000,000, fees paid \$9,500.

CONTRA COSTA COUNTY—Antioch Dam No. 3. Town of Antioch, Antioch, owner; earth, 26 $\frac{1}{2}$ feet above streambed with a storage capacity of 570 acre-feet, situated on unnamed creek tributary to San Joaquin River in Sec. 36, T. 2 N., R. 1 E., M. D. B. and M., for storage purposes, for municipal use. Estimated cost of enlargement \$300, fee paid \$20.

SAN DIEGO COUNTY—Lindo Lake Dam No. 830. San Diego County, c/o G. S. Kibby, Lakeside, owner; earth, 8 $\frac{1}{2}$ feet above streambed with a storage capacity of 50 acre-feet, situated on Lindo Lake in Sec. 18, T. 15 S., R. 1 E., S. B. B. and M., for storage purposes, for recreation use. Estimated cost \$800, fees not yet paid.

LOS ANGELES COUNTY—Patrick Reservoir No. 778-4. Santa Catalina Island Company, Avalon, owner; earth, 36 feet above streambed with a storage capacity of 3.4 acre-feet, situated on small creek tributary to Grand Canyon in Sec. 32, T. 9 S., R. 14 W., S. B. B. and M., for storage purposes, for domestic use. Estimated cost \$3,000, fees paid \$30.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of February, 1932.

INYO COUNTY—Tinemaha Dam No. 6-26. City of Los Angeles, Los Angeles, owner; earth, situated on Owens River tributary to Owens Lake in Sec. 25, T. 10 S., R. 34 E., M. D. B. and M.

BUTTE COUNTY—Lake Wyandotte Dam No. 63. Oroville-Wyandotte Irrigation District, Oroville, owner; earth fill, situated on North Honcut Creek tributary to Honcut Creek in Sec. 16, T. 19 N., R. 5 E., M. D. B. and M.

SANTA CRUZ COUNTY—Mill Creek Dam No. 96-2. Coast Counties Gas and Electric Company, Santa Cruz, owner; earth and crib, situated on Mill Creek tributary to Scott Creek in Sec. 29, T. 9 S., R. 3 W., M. D. B. and M.

EL DORADO COUNTY—Medley Lake Dam No. 97-57. Pacific Gas and Electric Company, San Francisco, owner; rock and earth, situated on South Fork American tributary to American in Sec. 30, T. 12 N., R. 17 E., M. D. B. and M.

SAN MATEO COUNTY—Millbrae Dam No. 618. Mills Estate, Inc., San Francisco, owner; earth, located in Buri Buri Ranch near Millbrae.

EL DORADO COUNTY—Finnon Dam No. 97-55. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Jay Bird Creek tributary to South Fork American in Sec. 16, T. 11 N., R. 11 E., M. D. B. and M.

ALAMEDA COUNTY—Bowles Dam No. 592. Claremont Pines Corp., Beverly Hills, owner; earth, situated on tributary to Temescal Creek.

EL DORADO COUNTY—Upper Cleese Dam No. 468-2. John P. Cleese, Placerville, owner; earth, situated on North Canyon tributary to South Fork American River in Sec. 36, T. 11 N., R. 11 E., M. D. B. and M.

SISKIYOU COUNTY—Hart Dam No. 181. E. C. & Kate C. Hart, Montague, owners; earth, situated on Martin Creek tributary to Little Shasta River.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of February, 1932.

SAN BERNARDINO COUNTY—Greenspot Dam No. 809. Western Fruit Growers, Los Angeles, owner; earth, 30 feet above streambed with a storage capacity of 1 acre-foot, situated on tributary to Santa Ana River in Sec. 8, T. 1 S., R. 2 W., S. B. B. and M., for storage purposes for irrigation and debris use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of February, 1932.

INYO COUNTY—Tinemaha Dam No. 6-26. City of Los Angeles, Los Angeles, owner; earth, situated on Owens River tributary to Owens Lake in Sec. 25, T. 10 S., R. 34 E., M. D. B. and M.

PLUMAS COUNTY—Taylor Lake Dam No. 288. J. L. Robinson, Reno, Nevada, owner; rock and dirt, situated on Taylor Lake tributary to Hungry Creek in Sec. 35, T. 27 N., R. 11 E., M. D. B. and M.

BUTTE COUNTY—Lake Wyandotte Dam No. 63. Oroville-Wyandotte Irrigation District, Oroville, owner; earth, situated on North Honcut Creek tributary to Honcut Creek in Sec. 16, T. 19 N., R. 5 E., M. D. B. and M.

SANTA CRUZ COUNTY—Mill Creek Dam No. 96-2. Coast Counties Gas and Electric Company, Santa Cruz, owner; earth crib, situated on Mill Creek tributary to Scott Creek in Sec. 29, T. 9 S., R. 3 W., M. D. B. and M.

EL DORADO COUNTY—Medley Lake Dam No. 97-57. Pacific Gas and Electric Company, San Francisco, owner; earth and rock, situated on South Fork American River tributary to American River in Sec. 30, T. 12 N., R. 17 E., M. D. B. and M.

EL DORADO COUNTY—Finnon Dam No. 97-55. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Jay Bird Creek tributary to South Fork American in Sec. 16, T. 11 N., R. 11 E., M. D. B. and M.

EL DORADO COUNTY—Upper Cleese Dam No. 468-2. John P. Cleese, Placerville, owner; earth, situated on North Canyon tributary to South Fork American River in Sec. 36, T. 11 N., R. 11 E., M. D. B. and M.

SAN MATEO COUNTY—Millbrae No. 1 Dam No. 618. Mills Estate, Inc., San Francisco, owner, earth, situated on a creek located in Buri Buri Ranch.

ALAMEDA COUNTY—Bowles Dam No. 592. Claremont Pines Corp., Beverly Hills, owner; earth, situated on Edith Street tributary to Temescal Creek in Oakland.

High type roads save two cents a mile in car operation, according to a nationwide study reported to the California State Automobile Association.

Foreman: "Well, everything all right?"

New Night Watchman: "Yes, I haven't done so bad for the first night. I've checked off everything, and there's only one thing missing—the steam-roller."—*Dixie Contractor*.

Coming up town the other night, we saw ahead a woman bent by years of service to her family and community. Her step was slow and uncertain. Her eyes were dim, and the cold wind filled them with unbidden tears. Past us raced a car far from under control. As it bore down upon the good old lady, the horn shrieked its menacing warning. Seeking safety, she hastily stepped from the beaten path into the deep snow. We wanted to wring somebody's neck.

Winter calls for greater courtesy to pedestrians. Hell will never be hot enough for the speed demon who is unmindful of their entire safety.—*Deer River News*.

Highway Raised 350 Feet from Floor of Shasta River Gorge

(Continued from page 2)

It will be noted on the accompanying sketch that on either side of the middle crossing of the river two large bends have been crossed with a fairly direct line. The channel at these points was deflected during formation by hard rock leaving two flat-topped spurs with crests approximately 100 feet above the grade of the new road.

In order to pass through these ridges with the new construction, it was necessary to rise above the river level to a sufficient height to avoid excessive cuts as the two cuts average 100 feet in depth with the grade line at the middle crossing 250 feet above the channel bed. By placing the line in this location, it was possible, with less than a mile of new construction to eliminate approximately two miles of distance as compared with the old road. Practically all of the 2.2 miles of distance saved on this new work was accomplished at this point. The remainder of the saving is in minor deviations in the old road.

IMPRESSIVE STRUCTURES

Five bridges were erected under the direction of the Bridge Department on this project, all 24-foot roadway structures. Two of them are of a concrete girder type; two were concrete arches; and one a steel cantilever bridge. This latter is a very striking structure rising high above the river at the middle crossing, the road emerging from deep cuts on either side of it. Parking spaces have been provided at both ends of the structure in order that motorists may stop and admire it, and the view as well. A list of these structures and their costs follows:

	Type	Length	Cost
Upper Crossing	Concrete Girder	275 feet	\$28,540 00
Dry Gulch	Concrete Arch	345 feet	70,952 27
Middle Crossing	Steel Cantilever	794 feet	183,144 26
Lower Crossing	Concrete Arch	582 feet	99,308 57
Klamath River	Concrete Girder	464 feet	80,957 81

The grading and surfacing work involved the removal of 774,663 cubic yards of material. The oil processing was, of course, road mix type, and followed the completion of the contract.

The aggregate cost of grading, bridges and oil processing reaches a total of \$1,154,851.68, or \$164,978.81 per mile. As a matter of interest I am including below a tabulation showing various engineering features of the old and new construction in comparison.

	Length	Delta Total	Lin. Ft. Curve-ture	No. of Curves	Radius Max. Min.	Max. Grade
Original construction	9.37 Mi.	3659°	13,827	137	1500 50	7.00%
Reconstruction	7.46 Mi.	1205°	16,840	25	5000 400	4.14%

	No. of Bridges	Adverse Grade	Roadbed Width	Lin. Ft. Bridges	Cost Per mile
Original construction	4	248 ft.	16 ft.	885	\$8,670
Reconstruction	5	146 ft.	24 ft. and 30 ft.	2468	81,550

The scenic attraction of the new construction should not be overlooked. Lying high above the Shasta River along the slopes of the canyon, long vistas of the spectacular gorge are visible, the stream following a tortuous course between rocky precipitous walls, crossing and recrossing the old highway down on the

NEW OFFICIAL LIST OF CONTRACTORS ISSUED

More than 23,600 contractors are today licensed to do business in the State of California, according to information given out by Colonel Carlos W. Huntington, Registrar of Contractors, at Sacramento.

"The State next week will issue the new official list of these registered contractors in a complete volume which probably will be published in the future twice a year, in the spring and fall," said Huntington.

"This complete and only official listing is given both alphabetically and geographically, so as to make this State publication of worthwhile value to the construction industry of the State, together with a copy of the Contractors' License Law and other information affecting this vast industry.

"We are issuing the publication at as low a cost as possible so that it may be within the reach of all in the construction industry, and its allied lines. It will be sold by the State at cost. Those desiring a copy or copies of the publication may write the Registrar of Contractors at Sacramento. The volume will be off the press of the State Printer about April 1st."

RELIEF CAMPS A SUCCESS

(Continued from page 12)

least partially an obvious emergency, and they have in fact worked out better than was expected.

For its expenditure, the Department of Public Works has received considerable work, its particular value being in the fact that most of it was, by nature, handwork that would otherwise have had to be done by regular crews.

Many worthy men in distress have been carried through a period which otherwise might have resulted in their complete loss of the spirit of self-reliance.

canyon floor at three points and finally escaping into the turbulent Klamath.

Above the highway bluffs and outstanding rock formations continue to rise from the mountain slopes, in many places gashed and broken with enormous talus slides. The canyon slopes are barren of vegetation, being only sparsely covered with scrub oak and brush. During the spring of the year, the upper slopes are clothed in green, and in the summer and fall the landscape assumes a rusty brown like most of the California foothill country.

During the winter these slopes are occasionally clothed with a mantle of white but are not of sufficient altitude to remain in winter dress for long. At the lower levels, the dark gray of the barren rock bluffs predominates throughout the year.

The road itself is attractive from a scenic standpoint. It is visible for long stretches through the canyon, a broad ribbon of black winding along the slopes. Its generous width gives the traveler a feeling of security common to motorists on California roads.

Romance in the Life of a Bridge

By JAMES GALLAGHER, Assistant Bridge Engineer

BRIDGES, like humans, grow old. They outlive their usefulness. Then its the junk pile and oblivion. But not so with the old Folsom Bridge, in its youth acclaimed the finest bridge on the Pacific coast.

The vicissitudes of its life compose a veritable bridge romance—beauty and fame followed by old age and the discard; plans for a tour abroad to start anew in a foreign country blighted by war; a relapse into oblivion and decay; sudden recall to active duty and

It was therefore imperative that a new bridge be built and at the same time desirable to invest as little money as possible in the new structure since it will only serve State highway traffic till such time as the new highway is completed.

LONG SPAN NEEDED

To cross the Klamath requires a long span bridge and an inexpensive timber trestle was out of the question. A second-hand truss span offered the best solution for a long span structure at a cost within the limits of funds which could be economically allotted to this project.

The old Folsom span was carefully inspected by engineers of the State Bridge Department and the steel work found to be in very good condition considering the length of time it had been exposed to the weather without painting or other maintenance. It had no defects which could not be easily repaired at small expense and was found to be amply strong to carry full legal present day loads.

The State was able to purchase the span from the Japanese for \$250, much less than he paid for it. The steel in the structure would cost, new, several thousands of dollars.

A contract was let to dismantle the bridge in its present location, transport it to Walker on the Klamath River and reerect it there. The contractor's false work for dismantling the span was quite ingenious.

The channel of the American River at this point is a deep, rocky gorge and on account of the danger



LIKE A SKELETON of the past the abandoned span stood for years beside the modern concrete structure that relegated it to the discard.

a new lease on life in another locality 300 miles distant.

Such is the story of the steel span built across the American River at Folsom, Sacramento County, in 1893 and now on its way to bridge the Klamath River at Walker, Siskiyou County. The span is 380 feet long with a 17-foot 6-inch roadway. It served Sacramento County for 25 years and was abandoned when the present concrete arch was built about 100 feet down stream.

For years it remained in its original location, its slim girders vaulting 55 feet in the air, a steel wraith beside the modern concrete structure.

WAR INTERVENES

Finally a Roseville Japanese saw an opportunity for a shrewd business deal. Steel was high in Japan. He bought the bridge cheap from the county and prepared to ship it for use on a Japan river. War intervened and the deal was off.

Where the Pacific Highway makes its first crossing of the Klamath River near Walker, a single lane, light suspension bridge built many years ago, is reaching the end of its service life. It has been posted as not safe for loads in excess of five tons. The future improved highway will not cross the Klamath at this point but will continue down the river on the north side of the stream. However, the present condition of the suspension span will not permit of its continued use until finances are available for completing the next section of highway on the north bank.



ON ITS WAY—Old Folsom span in process of being ingeniously picked to pieces and packed off to a new home on the Klamath River, 300 miles away.

from floods at this time of the year, it was necessary to span this gorge. The contractor constructed a timber truss span inside of the steel trusses but supported on suitable false work bents at either end. A traveler reaching above the highest point of the steel span was built on top of the timber truss.

Good Roads Paid High Dividends to California in 1931

FIGURES from National and State sources show that because of her fine highway system, California went steadily ahead during 1931 in general motoring activity and in volume of automobile ownership in spite of marked opposite tendencies that prevailed throughout the nation.

"Without a road an automobile is useless," says an authority of the automotive industry, "but as dollars are spent on road improvement, the value of the car increases and the investment in roads is returned many times over."

The truth of this statement is borne out by the following facts and figures for California:

Reports of touring bureaus as well as the state's gasoline tax receipts show that Californians made greater use of their cars in 1931 than in 1930.

Motor tourists from other states in California recorded a substantial gain.

Total motor vehicle registration in the State increased although in the nation as a whole there was a decrease.

The State total was 2,107,275, an increase of 7,982, or .38 of one per cent. While small, this increase is significant, considered in the light of a decrease of approximately 583,000 in total registration for the United States.

Cars bearing license plates of other states, which were checked as they passed into California through various border stations of the State Department of Agriculture, totaled 324,726, an increase of 31,336, or 11 per cent over 1930.

Motor vehicles in the State used 1,230,045,808 gallons of gasoline, an increase of 1.564 per cent over 1930.

DIDN'T HAVE LIGHTS

A late report tells of an Iowa team and farmer being killed while traveling along the pavement at night in that state. Did the owner have lights? Of course not! Not one in a hundred horse-drawn vehicles carries lights as it trundles along a dark highway, deliberately inviting death to its occupants, the team and to those in all passing automobiles. We can not think of any act more hazardous than that committed by a person who travels the highway at night in an unlighted vehicle.—*Albert Lea Tribune.*

During 1931 a total of 315,000 American motor vehicles were sold outside the United States, according to figures of the Automobile Chamber of Commerce. This included United States exports and the output of American-owned factories in Canada.

In Memoriam

CAPTAIN CHARLES A. NELSON, foreman of construction on the jetty at the mouth of the Russian River for the Division of Water Resources, was killed on March 2, 1932, while at work, by a fall from a cable.

Captain Nelson was in charge of this jetty work as foreman since August, 1929, and was an exceptionally reliable and capable man. By his death the State loses the loyal services of a man who was deeply interested in his work. He had a likable personality and quickly made friends with his associates and employees.

Born in Sweden near Gothenburg in 1867, Captain Nelson went to sea at the age of twelve, and qualified as master of sail by the time he was twenty-one. He followed the sea as mate and master until 1895, when he went into transportation business on San Francisco Bay and Sacramento and San Joaquin rivers, transporting building materials to the San Francisco Bay area and hauling hay and freight.

In 1915 he purchased a farm near Elk Grove which he operated until 1920, when he returned to navigation and the sand and gravel business. His search for gravel and sand deposits of good quality accessible by water to the Bay district led to his discovery of a satisfactory supply in the Russian River near its mouth in 1924.

Captain Nelson is survived by his widow, Mrs. Jenny Mariea Nelson; two sons, Harold and C. Norman Nelson; and three daughters, Mrs. George Nagle, Jr., Mrs. Thomas W. King and Lillian Nelson.

Federal Aid System Totals 323,000 Miles

When the first Federal Aid System map was published in 1923 the mileage on the system was about 169,000 miles. Since that time the mileage has been increased to 199,000. In 1923 the roads composing the State highway system, which also includes the Federal Aid System, totaled 203,000 miles and now the total is about 120,000 miles greater.

Much of this additional mileage on the State systems consists of roads taken over from counties and townships, which relieved them of a tremendous financial responsibility.

CATTLE RIDE TO MARKET

In 1931, 21,162,000 head of livestock motored to seventeen of the leading markets, a gain of one-fourth over the previous year when nearly 17,000,000 head were trucked. The 1931 motor truck shipments were more than $7\frac{1}{2}$ times as large as the shipments of 2,765,000 in 1920, according to the studies of the Corn Belt Dailies. The average haul is now 65 miles.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

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COLONEL WALTER E. GARRISON _____ Director

JAMES I. HERZ _____ Deputy Director

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Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND
Primary Roads ———
Secondary Roads - - - - -

CALIFORNIA HIGHWAYS and PUBLIC WORKS



APRIL
1932

One of the
Natural Water Resources
in Kings River Canyon

Official Journal of
THE DEPARTMENT
OF PUBLIC WORKS
State of California

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First Four Months of 1932 Show Marked Progress of Ten Year Plan

Forty-five Per Cent of Annual Construction Program Under Way
by May 1 With \$10,250,000 Released for New Work--
A Record of Activity Equal to Last Year

By COLONEL WALTER E. GARRISON, Director of Public Works

ORDERLY progress under the ten-year plan for highway construction in California continues with gratifying results.

Charged by the Legislature and the people with responsibility for the development of a great road system, the Department of Public Works is keeping the work fully abreast of the approved schedule.

The first quarter's (1932) record discloses activities by the Highway Division equal to those of the similar period of 1931.

Against a new construction program that totals \$23,000,000 for the year, there will have been released during the first four months more than \$10,250,000 for new construction. This means that 45 per cent of the year's schedule is under way the first third of the year.

Work orders issued since January 1 total \$6,085,300, and the projects awaiting the opening of bids (April 12) reach \$2,811,000. The total becomes \$8,896,300. By the end of April, approximately \$3,000,000 more will be placed by contract. Of this latter amount, \$1,620,000 is already under advertised call, leaving \$1,380,000 more to go out before May 1. The several amounts, when combined with the

work orders issued and projects advertised, will give an aggregate of \$10,276,300 in construction put under way by the first of May.

WORK IN HAND

In going activities, work to the amount of \$10,718,000 was carried over from last year. Without allowance for completions, the record of the Highway Division for the first four months of the year shows construction work in hand to the amount of \$20,994,900.

Nevertheless, California is not leading all her sister states in highway development. California is not spending more or building more than any other. Our State's position on the list of comparatives does not bear out the careless statement that we are overly ambitious in highway construction. The situation should be understood in order to refute erroneous statements tending to create a

division of sentiment as to the wisdom of maintaining our present progress.

On January 1 the position of California in highway building was as follows:

Sixth among the states in population.

Second in area.

Second in motor registrations.



COLONEL WALTER E. GARRISON

Groyne System Adopted in Widening State's Most Congested Coast Link

By S. V. CORTELYOU, District Engineer

OUTSTANDING in two ways is that section of the State Highway system known officially as VII-Los Angeles-60-B and generally called "Roosevelt Highway" or "Coast Boulevard," which extends from Santa Monica northwesterly along the coast to the point where Beverly Boulevard comes down to the sea. It has the highest traffic count of any portion of the State highway system and it is immediately adjacent to the most intensively used beach areas in southern California.

On Sunday, July 14, 1929, in a 16-hour period from 6 a.m. to 10 p.m., 53,303 vehicles passed over the highway west of Santa Monica Canyon, which means an average of 56 vehicles per minute throughout the whole 16-hour period.

This strip of coast line affords the most convenient series of beaches for that large metropolitan area extending along the foothills, including Santa Monica, Beverly Hills, Hollywood, Glendale, Pasadena, the northerly portion of Los Angeles, etc. During the summer months the use of the beach seems to be limited only by area available for parking of autos of those who drive down for beach bathing and picnicking. While there is a considerable volume of "through" traffic using this coast highway, the largest percentage of the traffic is due to the recreational use of the adjacent beaches.

CONTRACTS AWARDED

With a view of relieving the congested traffic and providing easier access to these beach areas, the State has recently awarded two contracts for very important and much needed improvements between Santa Monica Canyon and Beverly Boulevard. One contract includes the grading of a roadway 80 feet wide, of which 40 feet will be paved with asphalt concrete and 20-foot earth shoulders on each side will be oiled so that the full width of 80 feet will be used by traffic. Under a second contract the State will construct five groynes of steel sheet piling for shore protection.

A considerable portion of this section passes along beach frontage which has been set aside for State and county park purposes. In order to make these beach areas available, it is neces-

sary to provide highway shoulders wide enough to permit the parking of cars and at the same time not interfere seriously with traffic along the highway. Along the county and State beaches an additional 15- to 20-foot strip will be graded for the parking of autos outside of the 80-foot roadway.

PUBLIC BENEFACTORS

The property along the beach road is extremely valuable, and great credit is due the following owners of the property who have donated not only the 80-foot right of way but also have given the State the right to extend excavation and embankment slopes outside of this strip as required for an 80-foot width of roadbed: Alphonso Bell and the Los Angeles Mountain Park Company, R. C. Gillis and the Pacific Land Corporation; the Harold F. McCormack Company; The Huntington Palisades Property Owners' Association and Will and Betty Rogers. The deed from the famous American humorist was obtained immediately after his return from the Japanese-Chinese war front, and the League of Nations Peace Meeting in Europe.

The contract for widening this highway presents no unusual construction difficulties except for the shore protection and the large volume of traffic to be handled over the road during construction. The roadbed section along nearly the entire length of the project will be widened on the landward side by cutting into the adjacent cliffs with power shovels. This excavated material will be hauled in trucks and used to build up the embankment slopes on the ocean side of the highway.

ALONG PARK LANDS

Under present shore conditions, the embankment slopes of the widened highway along about 2400 feet of the ocean frontage, in the park lands of the State of California and the county of Los Angeles, would be subjected to severe erosion by the ocean. It would be impossible to maintain these embankment slopes without some kind of shore protection.

On account of the great value of and the demand for the sand beach area for recreational purposes, it became evident immedi-

(Continued on page 16)



GREATEST TRAFFIC DENSITY in the State is recorded for this section of the Coast Highway west of Santa Monica Canyon where 53,303 vehicles passed in a 16-hour period. The roadway will be graded to a width of 80 feet.



CONQUEST OF THE WAVES, soon to be ended, is depicted in this scene. Battering seas have wiped away the beach and are gouging out the highway slopes on this section of the Coast Boulevard northwest of Santa Monica.



HARNESSING OLD OCEAN, compelling it to work in building up beach by use of groynes or bulkheads, this view shows results obtained on Santa Monica coast. Note tops of groynes nearly submerged by newly deposited sand.

Maricopa-Ventura Highway Largest Joint District Cooperation in State

A HIGHWAY now under construction between southern San Joaquin Valley and the Santa Barbara coast and officially designated as "Joint Highway District No. 6" is unique in its history and interesting as the most outstanding example of cooperative highway building under the Joint District plan provided by law.

Among the first in the State to receive official recognition as an ultimately desirable highway route, this project was forced by

Pine Mountain into Sespe River, thence down Sespe River through the Sespe Gorge to Cold Springs, thence over the Topatopa Mountain range and down the north fork of Matilija River through Wheeler Gorge and Wheeler Hot Springs to the Ojai Valley, thence down the Ventura River to the city of Buena Ventura on the Coast Highway. The total distance is about 70 miles of which all but 11 miles will be new construction.

Under an act of the Legislature, adopted in



circumstances to wait nearly fifteen years before reaching the construction stage. Now being built through the cooperation of Uncle Sam, the State of California, and the counties of Santa Barbara, Ventura and Kern—it has achieved the distinction of being the largest cooperative project in the State in point of cost, length of project and number of cooperatives.

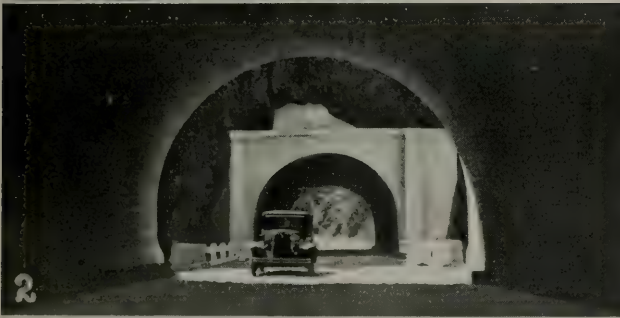
With the Coast Route 40 miles to the west, the Ridge Route 30 miles to the east, and no other intervening roads, this new highway makes a great saving in mileage between valley and coast and crosses one of the most rugged sections of the Coast Range of mountains.

The new highway leaves the Maricopa-Santa Maria State Highway at its entrance to the Cuyama Valley and follows up the Cuyama Valley to Ozena 20 miles, thence crosses over

1913, this road will become a State highway when fully completed. When the work now under way is finished there will remain a gap of only 17.4 miles to be built. This section lies between the two mountain ranges along the Sespe River.

The route makes two mountain ranges accessible to recreational traffic. San Joaquin Valley people can now reach Pine Mountain and people from the coast will soon be able to reach the Topatopa range. While through traffic will not be able to use this route until it is finished, local recreational traffic from each end can get into the mountains.

The Sespe, a virgin country inaccessible in the past except to pack outfits, is rugged and



THREE-IN-ONE SHOT is the unique bit of photography shown in picture No. 1 of a section of Maricopa-Ventura Highway where two short tunnels connected by a bridge are necessary to carry the road through a mountain spur and across Wheeler Gorge. The camera sees the three construction units as a black hole with a decorative entrance. No. 2 is taken from the interior of one tunnel looking across the bridge through the second bore. No. 3 shows finished portion of highway and No. 4 a view of Wheeler Gorge. Tunnel photos by Ben Blow, National Automobile Club.

How 240 Tons of Explosives Were Used Excavating Gorge Highway

The proper use of explosives in highway work is a fundamentally important item, and the following article describes the drilling, loading and blasting methods used on a contract of the Division of Highways that called for the excavation of some 700,000 cubic yards of material, most of which required heavy blasting and the use of over 480,000 pounds of explosives. The data for this article and the accompanying sketches were provided by Paul F. Green, Assistant Resident Engineer.

By C. S. POPE, Construction Engineer

THE SCENE of the blasting operations herewith described was on the relocated U. S. Highway Route 99 traversing the rocky sides of Shasta Canyon in northern California, beginning at a point about three miles north of the town of Yreka and extending to the Klamath River.

The canyon walls are steep and generally rocky, much broken up by dykes and rock masses, and the alignment at many places breaks through spurs and ridges which required cuts of considerable magnitude. However, a large part of the work was sidehill cut.

The rock formations were considerably broken and variable in structure as well as in hardness which required great care in drilling, method of placing powder pockets, and loading shots to avoid excessive overbreak.

The rock encountered was of igneous origin of unstratified, metamorphic, and eruptive types, varying in hardness from sound diorite to comparatively soft and shattered stone.

MINIMUM OF WASTING

Grade and alignment were worked out to secure as close a balance of cut and fill as possible, and, of necessity, blasting of rock overside, or wasting, was held to a minimum. The deep cuts through spurs or saddles required breaking the ground in place and hauling to fill sections.

The type of blasting chamber used in the different locations will be more easily understood if they are described by their local names, some of which are as follows:

COYOTE HOLES—A coyote hole is a drift to a powder chamber similar to a mining tunnel, except that the drift is made smaller and the rounds of shots are less in number of drilled holes. The arrangement of the holes, however, is the same, they having the back holes, the breast holes, the cut holes,

and the lifters, and the shooting system of delays is executed in the same way.

The cut holes are shot first, because they are drilled with the object in view of breaking out a wedge and forming a cavity for the balance of the holes to break to. They are two in number and are started usually one foot each side and a foot above the center of the face, and driven downward at an angle of 30° and outward so they meet a line parallel with the side of the drift at completion.

The two breast holes are drilled just above the cut holes but more to the sides and are driven in slightly downward from horizontal. They are shot second in rotation and placed to break out the center section of the drift.

The back holes are drilled as close to the ceiling as it is possible to work, and upward at an angle to give the required height, and outward to give the required breadth to the ceiling. They are shot third in rotation.

The lifters are drilled so as to break the bottom thoroughly and to lift the refuse, deposited by the other shots, back from the new face, so that a round can be started while the refuse is being mucked out.

COMPRISED A ROUND

All of these holes together are considered a round, and the depth of a round is the distance from the face of the drilling to a vertical plane passing through the bottom of the drilled holes. In most cases these rounds are 5 feet in depth.

In drilling the main drift, one driller and helper constituted a crew, but when cross drifts were run in conjunction, another driller and helper were used.

The drifts were constructed oval in shape and were not all of a uniform size, but were in general from 3.5 to 4.5 feet in height and from 3.0 to 4.0 feet in width.

Great Variety of Explosives Needed

(Continued from preceding page)

ahead of it, the theory being that it broke the section between these two holes ahead.

These holes were all sprung to form powder pockets at their base to receive the main blast charge. The distance apart and the amount of springing necessary to obtain good breaks was determined by the powdermen's observations in making a trial shot in the same type and character of ground, being generally about 10 to 15 feet apart.

MADE DEEP BREAKS

A combination with vertical down holes above a series of bootlegs was used in the breaking of deep lifts. Clean breaks were made as deep as 65 feet in porphyry.

Down holes and lifts were drilled in series of two rows each and staggered. They were drilled to a level plane, sprung and shot, and during the removal of the broken material, a second series of two rows of holes was drilled to the same level plane, sprung, and when the debris was removed from in front, they were shot and the program repeated until this lift had been removed.

Oftentimes the drilling would precede the shooting for considerable distances and sometimes a series of four rows of holes would be shot at one time. In general, however, only two rows of holes would be shot at once, as by so doing better breakage and more effective use of powder was secured. Another series of holes was then drilled from this now cleaned off level plane and the process repeated. The depth of these lifts was in most cases 25 to 30 feet.

The location of all powder pockets was accurately determined in relation to the grade line and slopes, and the powder charge was figured from the volume of rock to be broken as determined by the area of the cross-sections influenced by the explosive.

EXPLOSIVES USED

A great variety of explosives was used on this project. Black powder, 5% granular and 20% dynamite in bags, 20 to 60% dynamite in $\frac{7}{8}$ " and $1\frac{1}{8}$ " cartridges were all used in considerable quantities.

In general, No. 6 electric blasting caps were used for detonators and they were fired by a 50-hole push down electromagnet type blasting machine.

Delay electric blasting caps were used to advantage. The shooting successively of the various charges relieved the blast ahead and better results are secured with smaller charges. Their use was of especial advantage in holes near the slopes as the prior relief of part of the load permitted breaking outward rather than into the slope, thereby aiding to some extent in preventing overbreak.

Timed powder fuse was used only in "bulldozing" or in the shooting of short plug holes.

DRILLS AND COMPRESSORS

Drilling was all done by means of jackhammers, two makes similar in size and design to the B. R. C. 430 being used. These machines were operated at air pressures ranging from 90 to 110 pounds at the compressor and it is stated that pressure at the drills was seldom below 80 pounds.

Air for the drills was produced by both stationary

and portable compressors in accordance with the location of the drilling.

The heavier drilling was handled by three stationary compressors rated at 540 cubic feet capacity. Portable compressors furnished air to drills used for short holes and plugging. These compressors ranged in capacity from 120 to 360 cubic feet of air per minute.

Drilling was successfully accomplished to a depth of 25 to 35 feet in hard rock. Drill steel was of $\frac{5}{8}$ " octagonal type pierced to permit either air or water to be blown through it in cleaning out rock dust or other wastes.

DRILL BIT TYPES

Bits of both the cross-bit and chisel type were used with cross bits predominating because of the seamy nature of the rock. Drill bits varied in size according to the character of the rock, and the usual starting size varied from $1\frac{3}{4}$ " to $2\frac{1}{4}$ " in diameter. Drill bits were decreased in size usually one-eighth inch for each two-foot depth of hole, and great care was exercised to preserve the fluting of the bit to insure proper cleaning.

One crew on the work sharpened their steel by hand while another crew used machine sharpener, the results generally showing a margin in favor of the machine. The bits were sharpened with heavy shoulders, due to the irregular quality and formation of the rock to be drilled.

Swedish and American steel was used, both with varying success. Tempering the bits in oil and in water was practiced, one method showing no apparent benefit over the other. Good results were gained only where the blacksmith proved his skill in obtaining the proper heat color, and in the timing of the dip.

Following is powder data on six of the major thorough cuts:

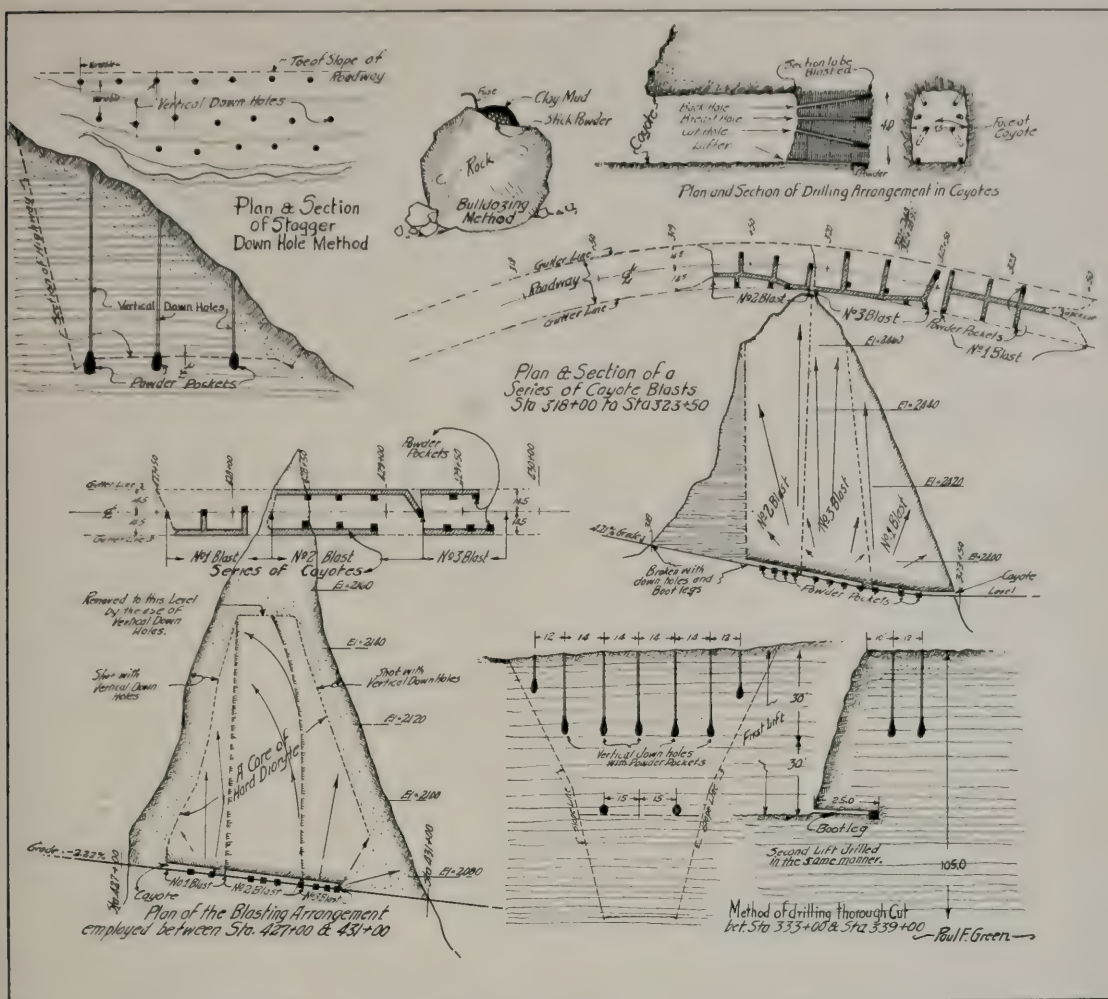
Method	Sta. to Sta.	Rock cu. yd.	Powder lbs.	Lbs. powder per cu. yd. of rock
Coyote	211-218	35,000	47,000	1.34
Lift	304-309	33,000	26,000	0.80
Coyote	317-324	28,000	54,000	1.93
Lift and down hole	332-340	65,000	58,000	0.90
Coyote	409-413	16,000	22,000	1.38
Coyote	427-431	40,000	51,000	1.25

The following data cover the major part of the blasting on the project as a whole:

Sta. to Sta.	Rock cu. yd.	Powder lbs.	Lbs. powder per cu. yd. of rock	20-30 per cent lbs.	40 per cent lbs.	60 per cent lbs.	Black powder lbs.
197-324	225,500	231,000	1.02	20,125	81,110	2,410	126,850
332-391	146,490	131,030	0.89	118,300	9,700	380	2,610
399-431	94,000	122,500	1.30	6,225	48,160	200	67,825
				144,650	138,970	2,990	197,285

HUMAN ELEMENT BLAMED

In three-fourths of the country's automobile accidents last year, improper actions on the part of operators of cars played an important part, as 645,000 of the 860,000 accidents reported involved some improper action by drivers. Ninety-one per cent of the drivers involved in fatal accidents had handled a car for more than a year. This also held true for those involved in nonfatal accidents.



POWDER POCKETS in a variety of styles are shown above, all of which were used in highway blasting operations in Shasta Canyon. The sketches reveal the careful plotting done by Highway Division engineers in planning the various "shots" to secure the best results.

Two Bridges Being Finished on Cut-off

On the Coast Highway from the Monterey County line to the San Benito River, 5.5 miles in length, a new road is being constructed via the Pincate Rocks. The roadbed will be 36 feet wide with a 20-foot Portland cement concrete pavement. This project, with a portion of the road in Monterey County 11.1 miles in length, recently completed, will eliminate the old San Juan Grade from the main Coast Highway.

Within the limits of this project there is under construction a reinforced concrete girder bridge over San Juan Creek and another over San Benito River.

Cambria-San Simeon Link to be Rebuilt

On the Coast Highway between Arroyo Grande and Los Berros Creek the road is being reconstructed with a 36-foot roadbed and a 20-foot reinforced Portland cement concrete pavement. It is now about 40 per cent complete.

Within the limits of the above project new concrete bridges are under construction across Arroyo Grande and Los Berros Creek and are about 50 per cent complete.

Bids are being received for the reconstruction of the Roosevelt Highway between Cambria and one mile north of San Simeon. This will be a 20-foot bituminous macadam pavement on a 30-foot roadbed.

State Ranks Low in Road Expenditure

(Continued from page 1)

Twenty-third in mileage constructed in 1931.

Thirty-seventh in per capita cost of highway improvements during the year.

Forty-seventh or next to the lowest in the Union in expenditures rate per registered car.

The small state of New Jersey spent \$48,000,000 as against our \$38,000,000 in 1931. Even South Carolina spent \$31,000,000 or more than 75 per cent of the California total.

All phases of public finance are involved in the acute economic condition prevailing throughout the land. Taxation is being measured by its burdensome totality rather than examined as to the relativities of its several items.

FUNDAMENTAL FACTORS

In view of the fact that California's ten-year program of highway construction is predicated on the present set-up of supporting revenues (gas tax, etc.) the continuance of the program may be involved. Recognition of the fundamentals involved will assure the stability of the great work in hand.

Highways are not a cost of government. They are a capital investment covering the cost of transportation. They are a necessary utility in the life of modern civilization.

Modern highways distribute actual savings to the motorist. As between a bad road and a good road, the savings in gas, oil, tires and maintenance made on the good road will go far to pay its cost.

In book accounting, the highway may properly be classified as a cost of transportation. The heavy credits of saving to motorists are applicable to balance the account.

Furthermore, the automobile has not created our great highway system. The building of highways has made possible the expansion of the automobile industry—its vast investments and great pay rolls. If we had no more or better highways than those of 20 years ago, we would probably have only about the same number of motor cars.

Highways are the visible, physical receipt for money expended—the stock certificate in a dividend paying enterprise.

The question of the relation of highway construction to taxation remains to be considered. The answer is easy and undeniable.

Not one cent on the tax bill of any city, county, school district or political subdivision goes to the State Highway Fund. Not one cent of the gross tax paid to the State by public utilities and carriers (electric, gas, railroad, etc.) goes to the State Highway Fund. Not one cent of any revenue supporting the State budget or State government goes to the State Highway Fund.

If the gas tax and special revenues from which highways are built should be summarily abolished, neither the fixed "cost of government" nor general taxation would be affected. The only result would be that the highways would be junked and the cost of government would have to be met from identically the same sources that are now bearing the burdens. I repeat my former statement that the financing of the highways is completely disassociated from budgets, tax rolls, tax rates and the cost of government.

The highways create their own revenue. Only those who use the highways pay it, and it is returned in service.

The gas tax is a compact between the motorist and the State. Highway money is a genuine circulating medium. The receipts of the first quarter reach our pay rolls the second quarter. We pay as we go, contracting no deficits and carrying no surplus.

ARCHITECTURAL AWARDS

For Month of March

AGNEWS STATE HOSPITAL—Contract for grading and roadwork to Earl W. Heple, San Jose, \$6,927.

SALINAS ARMORY—National Guard, contract for general work to Guth & Fox, Sacramento, \$45,786; plumbing and heating to Phillips Heating & Plumbing Co., Salinas, \$5,127; electrical work to Rodeo Electric, Salinas, \$1,845.

HUMBOLDT STATE TEACHERS COLLEGE—Training school building, for general work to Andy Sordal, Long Beach, \$112,441; for plumbing work to J. J. McDermott, Sacramento, \$8,688; for heating and ventilating work to W. H. Robinson, Monterey Park, \$17,414; for electrical work to Matson-Seabrooke Co., Oakland, \$8,156.

HUMBOLDT STATE TEACHERS COLLEGE, Arcata—Construction of tennis courts, to Malott & Peterson, San Francisco, \$7,981.

There were 46,000 automobile and truck dealers in business in the United States last year, according to figures received from the Automobile Chamber of Commerce.

More than 40 per cent of the country's wealth and 50 per cent of the buying power is now controlled by the women of the nation, according to an estimate appearing in a recent issue of the *Atlantic Monthly*.



JAMES ROLPH, JR.
GOVERNOR



Sending
 greetings
 and a
 message
 of cheer
 to the
 Building
 Industries
 Governor
 Rolph urges
 cooperation
 in speeding
 up work
 programs
 to give
 employment
 to citizens

To the Construction and Building Industry

GREETINGS:

With this issue of the Licensed Contractors' Register, I take the liberty of bringing you a word of good cheer.

You have been facing a period of subnormal business, but you have faced it courageously.

I say with all confidence that better times soon will come. Ours is a great country and our State is a great Commonwealth, filled with the sons and daughters of the pioneers who, too, battled and won over seemingly unconquerable odds. With this great heritage we are a people of vision and the urge to progress.

As you know, the State of California, of which I have the honor to be Chief Executive, has attempted to lead the way in stimulating the building industry during the past year. We have advanced our public works' schedules as much as two years so that we might give employment to our citizens and, in turn, stimulate those industries that are linked with us in the construction trade.

May I suggest that you of the Construction and Building Industry continue to support this program as a whole and adopt a like policy individually; pledging yourself to campaign throughout the whole State for a speeding up of all work programs.

In this regard, I have instructed the Registrar of Contractors to cooperate with you gentlemen in every degree.

I wish you all well.

Very sincerely yours,

Governor of California.

This facsimile letter is reprinted from the Licensed Contractors Register published by the State.

Famous Old Kit Carson Trail Being Treated With 350,000 Gallons of Oil

1 1 1 1 1 1

THE Department of Public Works, Division of Highways, opened bids on April 20th for oil treatment of 80 miles of the old emigrant road known as the Kit Carson Trail. The work extends from Pickett's Junction in Alpine County, westerly to Chapman's in Amador County, and includes as well a portion of the Luther Pass route in Alpine County from Hangman's Bridge near Markleeville to Alpine Junction.

This is the largest single oiling job this year in point of distance. The work involves spreading of over 350,000 gallons of oil.

The route passes through Hope Valley by Kirkwoods and over Carson Spur, where the scenery can not be surpassed, to Silver Lake. This portion of the road has never been oiled. From Silver Lake the road passes Tragedy Spring and Corral Flat to Cook's Station and on to Pine Grove and Jackson.

HISTORIC COUNTRY

This route is all through historic country made famous by the early trail blazers and the hardships of the '49ers. Many-out-of-State visitors will pass over the route this year, and enjoy in comfort the scenes so hardly won by the pioneers of less than a century ago.

The work, to be started as soon as road conditions permit, consists of spreading asphaltic road oil and working it in to provide a smooth, dustless surface. The preparation of the road surface, the care of traffic, and the mixing and leveling of the surface will be handled by State forces. The furnishing, hauling and spreading of the oil is to be handled by contract.

TWENTY-ONE-MILE HAUL

The oil must be hauled from Minden, Nevada, a distance of about 16 miles to the beginning of the job on the east, and from Martel for about 21 miles to the west end of the job. The oil is hauled by tender trucks to the work where it may be transferred to a spreader truck, or a spray bar may be attached to the tender truck and the spreading done without transferring the oil. The accompanying views show a spreader truck in action. The tractor and grader outfits are

covering and mixing the oiled surface material. The other is a view of the west fork of the Carson River, and is typical of many beautiful scenes on this road.

VACATION AREA

The area served by this road is a wonderful vacation country, in addition to the historical interest. The Lake Tahoe area is readily reached over Luther Pass, while an equally attractive loop trip is by way of Ebbetts Pass to Calaveras Big Trees, Angels Camp, and San Andreas, to Stockton, or by way of Minden, Bridgeport, Bishop and Mojave to southern California.

TEN-WORD SCOTCHOGRAM

Mr. John Burns,
New York City.

Bruises Hurt Erased Afford Erector Analysis
Hurt Too Infectious Dead.

Bert.

Which, translated means:

Bruce is hurt, he raced a Ford, he wrecked her, and Alice is hurt, too. In fact she is dead.

FAMILY HELPED THROUGH WINTER BY HIGHWAY WORK

Sonoma, Calif., April 19, 1932.

Col. W. E. Garrison,
Director of Public Works.

Dear Sir: If you will pardon the liberty I am taking in writing you, it is to express my appreciation, and say a word of thanks to you and the department you so ably represent. For the past four months I have been employed three days a week as a temporary worker on the highway, out of the Scheelville division. Temporary employment expires on the 30th of April, but it has been a godsend to me and my family of four over these winter months, and I for one am compelled to acknowledge what our higher officials are doing for the men of family, in need of work. I will close with remembrances and a kind regard for all, hoping to find other employment. Again, I say thanks a many.

Gratefully yours,

PAUL JOSEPHS,
Sonoma, General Delivery.



HISTORIC COUNTRY is traversed by the Kit Carson Trail, famous old route over the Sierra. Eighty miles of it will be oil surfaced through scenic countryside like this along the Carson River in Alpine County.



MODERN OUTFITS of the Division of Highways composed of tractor and grader team up in the preparatory work of leveling the road for the oil treatment and covering and mixing the oiled surface material.



PAINTING THE ROAD with a thick coat of asphaltic oil this spreader truck swiftly lays a dustless surface where the old emigrant trains trundled for miles through murky clouds of powdered dirt.

General Water Supply Conditions for State as Whole Best Since 1927

By **EDWARD HYATT**, State Engineer

THE beginning of the irrigation season in a large portion of the State is about April 1. By that date also the major flows of the coastal streams from the vicinity of San Francisco Bay region on the north to the Mexican line on the south has occurred, the major part of the replenishment of the underground basins along the coast has taken place, and these streams have settled down to what is often spoken of as the normal flow.

By that date also the snow surveys conducted by the State in the mountains have been completed and for all these reasons it is an appropriate time to give something of a preview of approximate water conditions which may be expected during the remainder of the year.

A more detailed report as to supply from streams draining both sides of the Sierras has been given in the Snow Supervisor's reports just issued and more detailed reports as to each area where investigations are under way or will be available. The Division of Water Resources is conducting investigations in many of the villages of the State and the following information relates to those specific areas in which the Division is in closest touch with the situation and no specific data are given for other areas.

GENERAL OUTLOOK GOOD

It is known, however, that the local water supply situation in the San Francisco Bay region is good, that the streams of Santa Barbara County have had a good run-off and that this is also true of San Diego County, where constructed reservoir capacity is sufficient to hold over a supply to the area using water for several years.

In general it may be said that the season of

1932 in California will be favorable as to water supply for irrigators, power companies and others using water from streams or from underground sources. For the dry farmer, however, the developments of the latter part of the rainy season have not been so favorable, as there has been little rainfall since about the middle of February. Taking the entire rainy season, however, up to April 1st, rain and snowfall have been normal or above except in the northern part; in some sections much above normal and in all parts of the

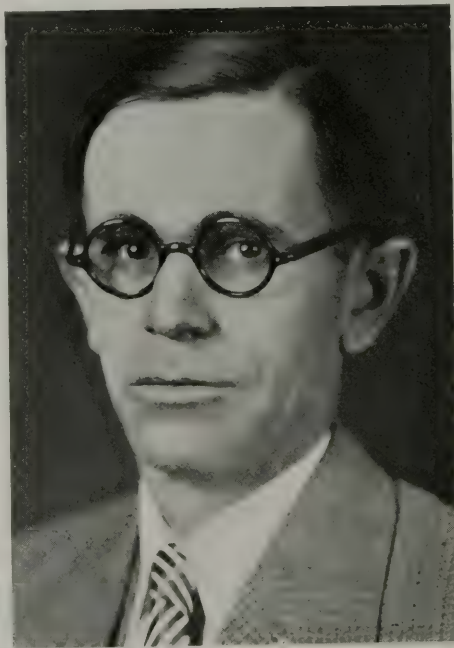
State much greater than during 1931. For the State as a whole it has been and is expected to be the best water year since 1927 from the standpoint of the water user. While there has been a heavy snowpack in the mountains climatic conditions have been such that the run-off is even and there have been no destructive floods. As the season is now well advanced it is not anticipated that there will be major floods unless unprecedented storms should occur.

FILLING UNDERGROUND BASINS

The gradual melting of the snow over a long period will afford the best opportunity for percola-

tion and the filling up of underground basins in the central valley. This has occurred to a marked degree, particularly in the coastal valleys, and should continue for some time to come in the central valley. A year of more than normal rainfall was badly needed in the State and the fact that such a year has occurred without destructive floods makes the situation particularly bright.

SOUTH COASTAL BASIN—This is the term applied for convenience to the area embraced in the valleys of Santa Ana, San



EDWARD HYATT

Good Gains in Southern Water Planes

(Continued from preceding page)

Gabriel and Los Angeles rivers and the coastal plains.

The rainfall here has been above average both in the valley and in the mountains, with a larger proportion of snowfall in the mountains than has been usual since observations were started. Run-off from the mountains has not been large, but has been unusually uniform, so that a large proportion percolated into the underground basins. Waste into the ocean has been small considering the rainfall. Owing to the numerous subdivisions into which South Coastal Basin is divided a detailed statement would be extremely lengthy.

It may be said that the upper Santa Ana Valley, that is, the part above lower Santa Ana Canyon, embracing the area from Pomona to San Bernardino, Redlands and Riverside, shows an average rise of water plane up to about April 1 of about 8 feet as compared to the low of last fall.

Upper San Gabriel Basin, which lies above Whittier Narrows and covers the territory from Pasadena to La Verne, shows a rise averaging about 10 feet.

The San Fernando Valley shows a rise averaging about 5 feet. The western coastal plain shows no rise.

The southern coastal plain, which is the area embracing Compton, Long Beach, Santa Ana and the western part of Orange County, in general shows an average rise of about 7 feet.

The outlook in some basins is for a further rise and for a sustained mountain run-off larger than has been the case in the past several years and approximating normal.

WELLS HAVE RISEN

MOJAVE RIVER—For the first time in several years the flow of Mojave River has been sufficient to cause discharge past Mojave Valley proper and into the desert sink. At the present time the discharge of the river is sufficient to take the flow past Barstow before it is all absorbed by the river bed. Wells near the river have risen but to date no effect has been found in wells at a distance from the river.

COLORADO RIVER—The outlook on the Colorado River is for normal flow or for flow perhaps even above normal.

OWENS VALLEY—The run-off into this valley is the principal source of water sup-

ply for the city of Los Angeles. Water is obtained both by pumping from the underground reservoir of the valley and by gravity diversion of Owens River and its tributaries. The streams are in flood from some time in April until the middle of July. The outlook is for a run-off somewhat above the long time average and more than twice that of last year, which should furnish the aqueduct demands and to an extent replenish the underground supply if this has been depleted by the pumping operations of the past several years.

PIT RIVER—This is a tributary of the McCloud River and thence the Sacramento. It drains the high plateau region of north-east California. The outlook is for discharges well above those of the past several years, but still somewhat below average. It is believed that the total run-off will be approximately the same as it was in 1928, which was about 20 per cent below the long time average.

INCREASED RUN-OFF

SURPRISE VALLEY—The situation in Surprise Valley is similar to that on the upper pit River. The streams of Surprise Valley rise on the east side of the Warner Range while the headwaters of the Pit originate on the west side. The run-off in Surprise Valley is expected to be well above that of the past several years and approximately 80 per cent of normal.

SACRAMENTO VALLEY—Only about 25 per cent of the area irrigated in Sacramento Valley draws its supply from wells. The remainder is irrigated from streams. Observations by the State on fluctuations of water levels are made only in the fall.

The outlook is for flows well above normal during the spring and summer from the principal tributaries rising in the Sierras on the east side south of Feather River. The principal discharge from the west side streams has already occurred and has been large, although actual discharges are not yet available.

From the Feather River and from the Sacramento proper above Red Bluff, snow surveys indicate a discharge below normal, but larger than that of the last few dry years.

SAN JOAQUIN VALLEY—There has been greater rise in the water plane near the water courses than at a distance, but an additional

(Continued on Page 20)

Groynes Will Make Ocean Build Beach

Continued from page 2)

ately that some type of shore protection work should be designed other than the massive seawalls or heavy riprap which have been successfully used elsewhere on the State highway system.

Experiments with the use of groynes have been under way on this portion of the coast for many years. Nearly ten years ago short wooden groynes constructed by this department on this section were successfully used to build up narrow sand beaches which "softened" the attack of the ocean and enabled us to protect exposed embankment slopes with a comparatively small amount of riprap.

Wilkie Woodard, engineer for R. C. Gillis and later for Alphonso Bell, constructed longer groynes which built up very large sand beach areas which these gentlemen have given to public use without cost for several years. A newer type of groyne is that built of steel sheet piling, and the effect of their installation is shown on an accompanying photograph.

EFFECT OF GROYNES

The purpose of the groyne is to intercept or check a portion of the current or littoral drift which follows along the beach in a direction about parallel to the shore. This current carries sand in suspension and it is a well known fact that a current of water carrying sand or silt will deposit this material when the current is checked. When the current of water is checked by the groynes, sand is deposited and is carried shoreward by wave action. As this process is continued the beach is built up along the groyne. By spacing these groynes at suitable intervals and con-

structing them of proper type and elevation along the shore a continuous beach can be built up. Eventually the groynes are nearly covered by sand.

This method has been used very successfully in building up the beach both east and west of the park area under consideration and at several other locations along Santa Monica Bay.

ADDS BATHING BEACH

It was decided that the highway slopes could be protected by building up the beach in this manner at a much less cost than in any other way and there would be the added advantage of providing a good bathing beach along the park areas which could be used by the public.

A design for groynes was accordingly worked up by State engineers. Each groyne is to extend 200 feet out from the toe of highway embankment. The 50 feet nearest the highway, which will be the first portion to be built up with sand after construction of groynes, was designed with light steel sheet piling, while the remaining 150 feet, which extends out into the surf, was designed with heavy type steel sheet piling to withstand wave action.

The contract for the construction of five of these groynes is being awarded in addition to the contract for widening the roadbed. Work under these two contracts will be carried on simultaneously with the view to completing the entire project in the shortest possible time. It is anticipated that work will be completed in time for use during the latter part of the coming summer.

Yellowstone Cut-off Celebration Planned

Heralding the virtual completion of the Yellowstone Cut-off project a public celebration will be held at Burns, Oregon, in June, reports the California State Automobile Association. Work on the principal remaining link in the series of connecting routes is in the final stages. This is a section of new road, 91 miles long, between Lakeview and Burns.

The Yellowstone Cut-off will provide a new

direct highway connection between California, Yellowstone National Park, and other important tourist and trading centers of the Northwest. It is officially designated as running from Redding through the Pit River Pass and the southeastern portion of Oregon to Boise, a distance of 560 miles.

The governors of California, Oregon, and Idaho, together with other officials and representatives of organized motorists in those states, have been invited by the people of Burns to take part in the dedication of the new road.

Two Tunnels and Bridge Necessary to Cross Deep Gorge

(Continued from page 4)

interesting. The south slope of the Topatopa Mountain range affords wonderfully interesting views of the Santa Barbara coast and islands. Side roads along the ridges and creeks crossed, can, with little difficulty, open up additional recreational areas that will soon be over-run by people from both the valley and the coast.

Pine Mountain is crossed at an elevation of 5000 feet and Topatopa Mountain at an elevation of 3700 feet. The Sespe Valley, which is followed for 8 miles, ranges from 3500 to 4500 feet elevation. All but the southern 20 miles, which is near the coast, and the northern 10 miles, is above 3000 feet elevation and can qualify as a scenic mountain road.

The width of roadway is to be 20 feet of traveled way. The alignment and grades are on good standard consistent with such rugged country.

A very unique feature exemplifying the difficulties encountered in the construction of this road is shown on the accompanying view of two tunnels with a bridge between them and so close together that the photographer has registered them all in one view. Such construction was necessary to get through the narrow tortuous defile, known as Wheeler Gorge, in a satisfactory manner. The gorge is only a short distance above Wheeler Hot Springs, a noted resort on this route.

Both coast and valley people have looked forward a long time to the completion of this important connection and the joint highway district organization deserves credit for the progress made in the face of great physical and financial difficulties.

The district constructed the section from Pine Mountain to the northern terminus, the State cooperating in cost under the Joint Highway District Act of 1917. Construction now under way in the north fork of Matilija River is being done by the U. S. Bureau of Public Roads and is a cooperative project financed from Federal Forest Highway Funds and County and State money in the Joint Highway District Fund. The uncompleted section of the through route will be similarly financed as Joint Highway District assessments upon the counties and the State become available.

Prunedale Cut-off, By-passing San Juan Grade, Opens in July

COMPLETION of the new highway project known as the Prunedale Cut-off and opening of the route to through traffic will take place about July 1, according to an announcement by C. H. Purcell, State Highway Engineer. With the opening of this stretch of approximately 16½ miles of new, modern highway, the bottleneck on the Coast Route, U. S. 101, created by the steep and winding San Juan Grade, will be removed.

The general location of the Prunedale Cut-off is on the Coast Highway about 100 miles south of San Francisco. Starting at a point about three miles north of San Juan Bautista, the road passes through the villages of Dumbarton, Prunedale and Santa Rita and rejoins U. S. 101 about two miles north of Salinas. Eleven miles of the southerly part of the route are now in use for local traffic and for those familiar with county roads in the vicinity.

While the San Juan Grade passes over the Gabilan range of mountains, the Prunedale Cut-off proceeds over mesas and through valleys in the foothills on a route where the highest elevation is 550 feet, compared to 1050 on the San Juan Grade. Long flat curves and easy grades will permit high gear travel the entire distance on the new route. There will be a saving of 1.2 miles in distance. The cost of the project is nearly \$1,000,000.

Scenic and historical attractions will also be offered by the Prunedale Cut-off. The road follows partly along the route of the old "Camino Real," between San Benito and Monterey counties. At one point it passes through a narrow gorge known as the "Pinecate Rocks," a bandit lair in early days. In order to preserve this point of interest 12 acres of additional right of way have been obtained at "The Rocks."

The old San Juan Grade route will be retained as a part of the State highway system.

FOREST TRAGEDIES

Predatory ants are blamed for the destruction of young quail, according to a report from the Tahoe National Forests. Ants sometimes attack the quail chicks immediately after they are hatched and consume them completely, even polishing the bones.

Three does with horns paid the penalty of their masculine disguise during the past hunting season. One was killed on the Sequoia National Forest and two on the Modoc National Forest, according to reports from the forest supervisors.

Fifteen Major Highway Projects in Fourteen Counties Advertised for Bids

THE impetus given to the advertising of projects for construction on California's State highway system by the arrival of spring has shown marked advancement in the program of the Division of Highways.

The April advertising program of State highway construction includes 15 separate major projects, located in 14 counties, and involves improvement to 80.2 miles of highway and the construction of five major bridges, with a total estimated cost of approximately \$2,400,000.

In addition to major projects, the annual program of the Division for applying oil as a dust palliative to unpaved roads and earth shoulders is now in full swing. The 1932 oiling program plans the application of oil to approximately 1660 miles of State highways at an estimated cost of approximately \$550,000.

During March projects for dust layer oiling, amounting to approximately \$100,000 and covering nearly 300 miles of State highways, were advertised and plans indicate that these figures will be more than doubled during April.

PROJECTS DESCRIBED

Brief descriptions of the more important projects which will be advertised during April follow:

In Solano County an important improvement to the San Francisco-Sacramento lateral will be started with the advertising for bids of the relocation of this important and heavily traveled arterial between Cordelia and Fairfield. The new location of this portion of the highway will be on a more direct routing between these two towns than obtains on the existing road, eliminating the present division via Rockville. The new highway will be paved with Portland cement concrete 20 feet wide and will shorten the distance by nearly a mile.

Another improvement to this highway between the San Francisco Bay area and the State Capital will be started with the advertising for bids for placing a Portland cement concrete pavement between Swingle and the Yolo Causeway in Yolo County. This new

pavement will be located between the town of Davis and Sacramento and will replace a particularly rough section of existing pavement. The work will include widening the roadbed to the standard 36-foot width throughout the length of the improvement and providing adequate 8-foot shoulders on each side of the new 20-foot pavement.

ARROWHEAD TRAIL LINK

Further improvement to the interstate highway which is the most direct route between Los Angeles and Salt Lake City will be started in San Bernardino County between Halloran Summit and Mountain Pass. The proposed improvement will be the same type which the Division of Highways has used so successfully on the hundreds of miles of desert and mountain roads in southern California, consisting of a standard 36-foot graded roadbed surfaced with bituminous treated crushed rock 20 feet wide.

Improvement to this route has been pushed eastward from San Bernardino towards the State line near Jean, Nevada, as rapidly as possible. Of the 193 miles between San Bernardino and the State line 156 miles have been completed or are under construction at the present time and the completion of the present project of the 16.5 miles between Halloran Summit and Mountain Pass will leave only 21.5 miles of highway remaining to be brought to modern standards.

The third and final unit of the construction of the new juncture of the Oxnard-Serra Highway with the Coast Route near El Rio in Ventura County will be set in motion with the advertising for the grading and paving of the portion of the Oxnard-Serra Highway north of Oxnard.

Construction is now in progress on the new 1800-foot steel plate girder bridge across the Santa Clara River on the Coast Route just northwesterly of the proposed new junction of these two routes, and work is nearing completion on the grade separation under the tracks of the Southern Pacific Railroad on the new alignment of the Serra-Oxnard road.

The present project proposes grading the roadbed on the new alignment and placing a 20-foot concrete pavement over the new por-

Work Offered for Bids in April

Improvements totaling \$2,374,000, estimated cost, scheduled to be advertised for bids prior to May 1, 1932, include fourteen major projects on State highways in fifteen counties. The work offered for contract comprises 80.2 miles of pavement and surfacing and five bridges as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type of Surface
Solano	At Rio Vista	0.8	P. C. C. Pave.
Ventura	Santa Clara River to Ox- nard	2.0	P. C. C. Pave. A. C. Pave.
Solano	Cordelia to Fairfield	6.4	P. C. C. Pave.
Yolo	Swingle to Yolo Causeway	1.7	P. C. C. Pave.
Orange	Laguna Beach to Dana Point	7.5	P. C. C. Pave.
Del Norte	Crescent City to Madrona Camp	6.9	B. T. Cr. Rock
San Bernardino	Halloran Summit to Mountain Pass	16.5	B. T. Cr. Rock
Tulare	Lemon Cove to Three Rivers	8.5	B. T. Cr. Rock
San Mateo	San Mateo to Redwood City	7.3	B. T. Cr. Rock
San Luis Obispo	Cambria to San Simeon	9.7	B. T. Cr. Rock
Sacramento	McConnell to Sacramento	11.9	B. T. Cr. Rk. B'drs.
Tuolumne	Sonora to $\frac{3}{4}$ Mile East	0.6	U. Cr. Rock
Shasta	At Clear Creek Near Tower House	0.4	U. Cr. Rock
San Luis Obispo	Across San Simeon Cr. and at Station 141		2 Bridges
Los Angeles	Across Los Alamos and Gorman Creeks		3 Bridges

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement	17.2	\$826,500
Asphalt Concrete Pavement	1.2	
Bituminous Treated Crushed Rock Surfacing	48.9	1,170,700
Bituminous Treated Crushed Rock Borders	11.9	185,400
Untreated Crushed Rock Surfacing	1.0	45,400
Bridges	(5)	146,000
Totals	80.2	\$2,374,000

Full Reservoirs in San Joaquin Valley

(Continued from page 15)

large contribution to the ground water is to be expected from the canals used for gravity diversion from the streams and distribution of waters, and this will occur after the irrigation season has started.

The outlook is for large well sustained run-off in the numerous streams from the mountains. It is expected that this will be well above normal and several times that of the past dry years. This will begin with the melting snow and the quantity should be sufficient to fill all reservoirs to overflowing.

BEST SINCE 1922

The larger amount of water available for gravity diversion, as well as causing greater deep percolation to the water plane both from stream beds and gravity ditches, will decrease the amount of pumping necessary, and these two conditions are both helpful to the underground water situation.

As of April 1, a few representative wells not situated near water courses showed, as compared to last fall, rises of from 2 to 5 feet. The indications are that on the average a greater rise will occur in the water plane of the San Joaquin Valley during the coming irrigation season than has occurred in any season since 1922.

NAPA VALLEY—Measurements at representative wells in Napa Valley on approximately April 1, show a rise from last fall of from less than 1 foot to 20 feet with an average of 8.5 feet. In the St. Helena area the average rise of the wells measured was approximately 9 feet, in the Napa area 6 feet and in the delta of the river 10 feet.

ABOVE AVERAGE

Rainfall and run-off were both above average for the season, and large quantities of water wasted into the bay. Only a small part of the stream flow percolates into the underground basins as conditions are unfavorable for such percolation. Geological conditions in the valley indicate the probability that underground supplies do not yet fully show the effect of the wet winter.

Outlook is for better sustained summer flow than has been the case for some years back.

SANTA CLARA VALLEY (SANTA CLARA COUNTY)—Both rainfall and run-off have been above the long time average,

but no data are available at the present time from which the actual run-off can be computed. A considerable amount of water has wasted into the ocean from the mountains and the run-off from the valley floor itself into the ocean has been large. **The average rise in water plane over the entire valley has been about 23 feet since last fall up to the first of April and the major average rise has been in the broad central part of the valley and near Alamitos.**

In a limited area south of Cupertino and west of Campbell, extending to the foothills, the rise has been 5 feet or less. This same approximate rise took place also in the area between Evergreen on the east side of the valley and the city of San Jose.

Immediately around Cupertino the rise has been 15 feet or somewhat less than over the entire remaining valley the rise has been 15 feet or more with the greatest recovery in the vicinity of the streams, particularly the major west side streams where several wells showed rises of over 40 to 50 feet. The greatest rise measured was south of Guadalupe Creek near Alamitos where one well shows a recovery in water plane of over 70 feet.

Water levels on the valley floor are considerably lower, however, than one year ago at this time, a comparison of levels in the Cupertino, Santa Clara and San Jose area showing a recession during the year of about six feet. The outlook is for summer flows larger than during the past several dry years, but the amount of summer flow in Santa Clara Valley is never of significant proportions.

WELLS SHOW RISE

SALINAS VALLEY—Measurements on representative wells in Salinas Valley on approximately April 1, show a rise of from 2 feet to 29 feet since last fall with an average of 11.5 feet. In the Greenfield area south of Soledad the average rise of wells measured was approximately 8 feet; in the Soledad area, 6 feet; in the Gonzales area, 11 feet; and in the Salinas area 13 feet.

Rainfall and run-off were both above average for the season and one flood was particularly heavy. The situation along the river and its tributaries below King City is very favorable for percolation from the stream and

Wells Show Rises Up to Fifty Feet

(Continued from preceding page)

large contributions to the underground water have occurred from this source. Measurements indicate that the cone of Arroyo Seco is especially adapted for percolation.

Outlook is for better sustained summer flow and water level than has been the case for some years past.

VENTURA COUNTY—The rainfall and run-off in Ventura County was well above normal during the past winter season. Large discharge into the ocean occurred and even yet, despite considerable natural percolation in stream beds and diversions to spreading works off stream, there is a discharge of about 60 second-feet into the ocean from Santa Clara River.

This river is the principal stream of the county and along its valley and the cones of its tributaries rise in water levels in representative wells about April 1 has been in some cases more than 50 feet. The average rise at several such wells at and above Saugus is only about two feet, but in the Castaic area it varies from 12 to 30 feet. Around Piru it averages about 46 feet, around Fillmore 10 to 15 feet, and around Santa Paula

it averages about 17 feet, but some wells have risen as much as 40 feet.

FIFTY-FOOT RISE SHOWN

In the vicinity of Saticoy and Montalvo the rise at the wells measured averages about 12 feet; in the Oxnard Plain about 10 feet; in the general vicinity of Camarillo about 10 feet and in the Santa Rosa area about 10 feet. In the Moorpark area there is very little rise but in the Santa Susana or Simi Valley the rise varies from 1 to 14 feet.

In the Ojai Valley in the vicinity of Ojai the rise at the wells measured averages 50 feet and in the Ventura River Valley 6 to 20 feet.

The outlook is for summer flows better than usual and for further rise in water plane in some areas.

Due to the more than normal snowpack in the mountains in January it was feared that destructive floods might occur in the central valley; however, the season has developed in such a way that this has not happened. Inasmuch as large storms seldom occur after the first of April, it is hardly to be anticipated that there will be appreciable flood damage.

Fifteen Highway Projects Advertised

(Continued from page 18)

tion, widening the existing roadbed and placing a new asphalt concrete pavement on the portion where the line follows the present alignment.

In San Luis Obispo County two projects are proposed for advertising in April for construction on the 10 miles of the San Simeon-Carmel Highway north of Cambria. The one project plans the reconstruction of the highway on an improved alignment skirting the crest of the rugged bluffs along the ocean and the other includes the construction of two bridges on the new line. The new highway will be surfaced with 20 feet of bituminous treated crushed rock and the bridges, one across San Simeon Creek and the other across an unnamed inlet at Engineer's Station 141, will both be of the steel stringer type, resting on concrete piers set on timber piles, with

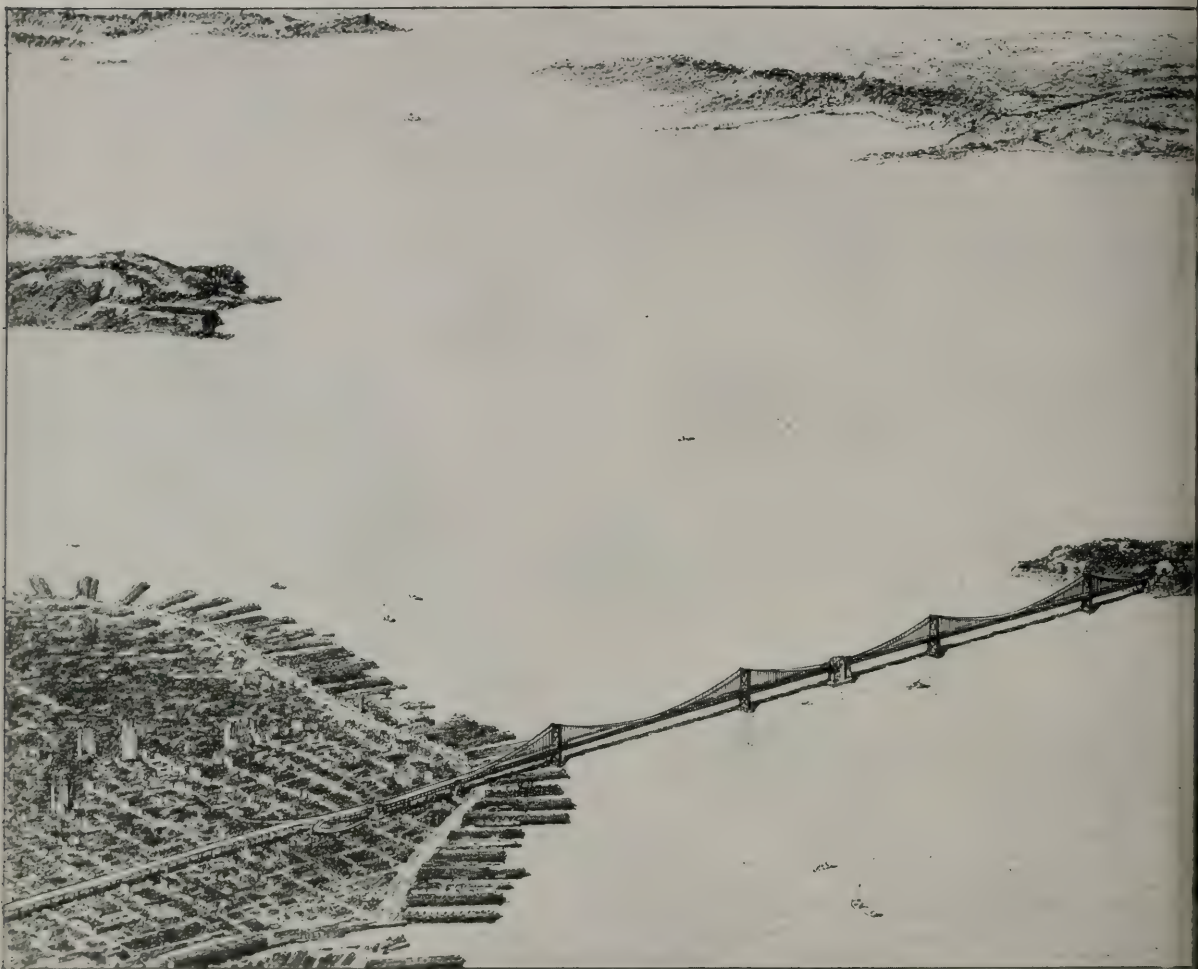
a 24-foot roadway and concrete decks. The bridge across San Simeon Creek will be 398 feet long, and the one at Station 141, 268 feet long.

Further work on the Bay Shore Highway will be put under way providing for placing a bituminous treated crushed rock surfacing 42 feet wide on the section of this new route between San Mateo and Redwood City. This portion of the highway is built upon heavy fills over tidelands and was temporarily surfaced two years ago to allow time for settlement before the permanent pavement was placed. Settlement and subsidence of the fills has taken place in several sections so that it now becomes necessary to bring the roadbed up to grade and resurface the entire section.

A project which proposes the widening of the effective pavement on the heavily traveled

(Continued on page 44)

General Final Plan Accepted for the



THE preliminary final design of the San Francisco-Oakland Bay Bridge was completed early in April and presented to Colonel Walter E. Garrison, Director of the State Department of Public Works. The design of the \$75,000,000 structure was prepared by Chief Engineer C. H. Purcell and his staff.

Following its approval by Colonel Garrison, the design was submitted to the Board of Engineering Consultants, headed by Ralph Modjeska, which met in San Francisco on April 18th. Its approval by the Board means that final designs will be prepared immediately.

The preliminary design calls for a cantilever type structure for the East Bay channel and a central anchorage type for the West Bay crossing.

REQUIRES TWENTY SPANS

The design for the East Bay structure calls for one 1400-foot center span, five 504-foot spans and fourteen short spans of 288 feet each to the Key Route Mole. The East Bay structure will have a clearance of 185 feet above high water, graduating to 165 feet at the harbor line.

The center anchorage type recommended for the West Bay crossing calls for two 2310-foot spans and four 1160-foot side spans. To join the two independent structures a center anchorage is required to which the cable from each side structure will be secured.

The center anchorage as designed will be 120 x 210 feet with a clearance above high water graduating from 214 feet at the center to 180 feet at the harbor line.

San Francisco-Oakland Bay Bridge



CONNECTED BY BORE

The two structures will be connected by a single bore tunnel through Yerba Buena Island, approximately 500 feet in length, 70 feet wide and 50 feet high.

Foundation borings for the San Francisco approaches have been completed, according to Chief Engineer Purcell. Island borings and bay borings were completed in time to submit to the Board of Engineering Consultants.

Property owners of San Francisco and the East Bay communities will not be called upon to finance the cost of constructing approach facilities for the Bay Bridge, and both sides of the bay will receive identical treatment.

This was made plain in a statement recently issued by Colonel Garrison, Director of the

State Department of Public Works, in amplification of his address at the ceremonies officially starting the bridge toward construction, held at Yerba Buena Island, February 24th. Colonel Garrison's statement was embodied in telegrams sent to the Alameda Taxpayers' League and the Central Council of Civic Clubs of Alameda County. Those groups had announced petition campaigns against formation of assessment districts to finance approaches.

PROPERTY OWNERS ASSURED

Colonel Garrison advised the groups as follows: "Arrangement of adequate approach facilities on both sides of the bay contemplate identical treatment. Our plans provide for adequate approach facilities connecting with the street systems of the East Bay

(Continued on page 42)

Solomon Canyon Cut-off to Effect Annual Savings of \$84,000 for Traffic

By **N. D. DOUGLAS**, Assistant Engineer, Surveys and Plans

WITHIN the last few years, the State has put under way a comprehensive highway improvement program with a view toward developing the entire State Highway System as quickly as possible to a standard which will serve traffic efficiently. Owing to the phenomenal growth of the volume and speed of automotive traffic during the past fifteen years, and to the existence of a large

FOUR GRADE CROSSINGS

Aside from the condition of the pavement, the existing road involves several other features which are disadvantageous to traffic, *e.g.*, several sharp right-angle curves, four grade crossings over the Pacific Coast Railroad, and (as will be noted on the accompanying sketch map) a loss of about five miles of distance due to following a sparsely settled agricultural valley between Los Alamos and Orcutt.



mileage of roads built prior to this unforeseen growth, a certain amount of relocation of existing roads is necessary in connection with the improvement program.

The so-called Solomon Canyon relocation is now under construction between the towns of Los Alamos and Santa Maria on the Coast Highway (U. S. 101) in northern Santa Barbara County. The existing road consists of a Portland cement concrete pavement 4 inches thick and 15 feet wide on a graded roadbed varying from 15 to 21 feet in width. Most of this was built in 1913-1914 and the pavement is practically worn out now, having served the bulk of its economic life. The necessity for early replacement, therefore, was inevitable, as the fast heavy modern traffic is rapidly breaking up the 18-year-old pavement, requiring increasingly heavy maintenance expenditures.

Regarding this last point, it must be remembered that the original road was located when through traffic was very light and local traffic was relatively much more important than now. It constituted the only improved north and south road in this vicinity and properly served a majority of the local rural population, although its builders must have been aware of the existence of the Solomon Pass through the hills north of Los Alamos, which provides a natural highway location on almost a straight course between Los Alamos and Santa Maria.

As the time for repaving approached, traffic conditions had changed decidedly. Eighty-five per cent of the total was now through traffic, and only 15 per cent was local. Average road speeds were 40 miles per hour instead of 25, making the effect of the existing curves most objectionable. The exist-

New Route Eliminates 33 Curves

(Continued from preceding page)

ing pavement was too old to handle the total traffic much longer, but in good enough conditions to handle the light local traffic alone indefinitely with little maintenance, thereby providing efficient local service and a maximum salvage value.

In recent years, engineers had gained definite knowledge of the cost of automobile operation and of the operating economies of distance reduction. And the Solomon Pass provided a natural route slightly over $4\frac{1}{2}$ miles shorter than the existing road. Relocation was decided upon as the result of exhaustive comparative studies.

The completed project which is now under construction will cost about \$530,000, and will provide a modern concrete pavement from 7 to 9 inches thick and 20 feet wide, on a 36-foot graded roadbed.

Resurfacing the existing road to an equal standard which is the minimum required by the present average traffic of 2000 vehicles per day, would cost as much or more due to its additional length. Therefore, there is no increased cost due to relocation. On the other hand, the relocation will effect for the average present through traffic an actual saving in operating costs of about \$84,000 per year due to distance reduction.

This saving represents an interest or income of nearly 16 per cent on the total expenditure for the improvement, which is obtained entirely by means of the relocation, and which will increase almost directly in proportion to the volume of traffic. In what other line of investment could such a yield be obtained?

THIRTY-THREE CURVES ELIMINATED

A general comparison between the existing and relocated roads is shown in the following table:

	Existing road	Relocation
No. of curves less than 1000-foot radius----	33	0
No. of curves less than 500-foot radius----	8	0
Total rise and fall-----	1300 feet	1470 feet
Total curvature-----	1222 degrees	257 degrees
Maximum gradient-----	6.00 per cent	5.45 per cent
Length of gradient over 5 per cent.-----	2000 feet	500 feet
Minimum vertical sight distance-----	300 feet	800 feet
No. of railroad grade crossings-----	4	2
Length-----	20.30 approx.	15.69 miles

HOW ROAD CONDITIONS AFFECT OPERATING COSTS

The following table, taken from "Operating Cost Statistics of Automobiles," a bulletin by Professors T. R. Agg and H. S. Carter of Iowa State College, gives enlightening information on the effect of road conditions on various items of operating costs:

Item of cost	Sum expended for the item when using high type roads	Sum required for equal mileage on intermediate type roads	Sum required for equal mileage on low type roads
Gasoline -----	\$1 00	\$1 20	\$1 47
Oil -----	1 00	1 00	1 00
Tires and tubes	1 00	2 22	2 90
Maintenance	1 00	1 20	1 47
Depreciation --	1 00	1 10	1 24
License -----	1 00	1 00	1 00
Garage -----	1 00	1 00	1 00
Interest -----	1 00	1 00	1 00
Insurance -----	1 00	1 00	1 00

MOTOR TRUCKS ON SAHARA

Establishment of a regular motor transport service over the Sahara Desert is being considered. The plan depends on results of an experimental trip by a caravan of eight trucks, equipped with heavy oil engines. The proposed run extends between Algiers and Gao, on the southern boundary of the desert, a round trip distance of 3840 miles.

From the preceding discussion, it is evident that the Solomon Canyon relocation represents in all respects an efficient investment of highway funds. It leaves the existing road to serve as a detour during construction and to efficiently accommodate the local wayside traffic with complete utilization of every unit of its salvage value.

It provides for through traffic a road of the highest standards of construction, adapted to unlimited future development in width, etc., as required by future traffic, and suitable for unlimited traffic speeds. It provides an ultimate location for which there never will be a reason or excuse for relocation. And it yields a handsome return on the funds expended for its construction.

In closing, it may be stated again that the economic features of this relocation are typical of all of the relocations which have been made or are yet to be made by the State. In every case, departure from the existing road is made only on the basis of a thorough economic analysis.

Highway Commission Holds Meetings at Riverside and San Luis Obispo

THE California Highway Commission had a busy month, holding three meetings in different parts of the State, each meeting a crowded gathering of official delegations and citizens eager to hear and be heard on road matters in which they are vitally interested. Two of the meetings were held in the county seats of Riverside and San Luis Obispo, the third at the Commission's headquarters in the State capital.

The meeting at Riverside on March 28 was held conjointly with the ceremonies attending the dedication of the new Rubidoux Bridge at the westerly gateway to the city by Governor James Rolph, Jr., on March 29th.

The entire commission and executive staff present at the meeting were: Commissioners Earl Lee Kelly of Redding, chairman; Frank A. Tetley of Riverside; Harry A. Hopkins of Taft; Timothy A. Reardon of San Francisco; Philip A. Stanton of Anaheim; Colonel Walter E. Garrison, Director of Public Works; C. H. Purcell, State Highway Engineer; C. C. Carleton, chief of the Division of Contracts and Rights of Way, and John W. Howe, secretary.

FOURTEEN HEARINGS

The spacious and splendidly equipped audience chamber of the Riverside County Supervisors in the County Courthouse, assigned to the use of the Commissioners was thronged with several hundred men and women all through the session while fourteen delegations were given hearings and decisions.

A delegation of five representatives of the Victorville-Bear Valley Road Improvement Association—C. E. Cooper, A. J. Lintner, T. J. Thomas, Judge Hoffman, Frank Hubbard, James Goulding and June Gobar requested the inclusion in the State secondary highway system of the road from Big Bear Lake to Victorville.

W. A. Ayer and D. Mulherron asked the allocation of funds to improve eight feet of shoulders through the town of San Clemente.

A delegation from Brawley including C. J. Park, Henry Jackson, S. D. Carey, G. E. Krueger, R. L. Baker, requested State cooperation in the improvement of Western Avenue in that city, presenting a resolution embodying the request signed by Mayor J. C. Fluke and Councilmen H. E. Hubbard, I. A. Pearson, R. L. Baker and A. S. Wolfe.

The improvement of Route 59, Lancaster to Cajon, was urged by Secretary R. H. Mack of the San Bernardino Chamber of Commerce, J. B. Gill, I. N. Gilbert, Arthur L. Doran, Howard L. Way.

ASK ROUTE CHANGE

Stanley W. Guthrie, Frank B. McMillan and Charles S. McMillan requested a change in the realignment of Brea Canyon Road, southwest of Pomona.

The following delegation appeared relative to the proposed location of the State highway west of Pomona: A. B. Marshall, Mrs. J. M. Whitehead, Margaret H. Mackensie, Cecil George, David Porter, W. L. Williams, Mrs. Arthur Bates, Charles A.

Emory, W. L. Rose, J. M. Paige, Mark Potter, A. P. Nichols and W. M. Harris.

A change in the proposed routing of the State highway from Pomona through the city of Chino was requested by Ernest W. Soper, Frank Mogle, W. A. Kutz and Dr. Harold Miller.

Chairman H. W. Wright of the Los Angeles County Board of Supervisors asked that additional time be given that county for securing rights of way on a proposed cooperative project between La Canada and Lincoln Boulevard before withdrawal of the State's share of \$210,000 set up for that project. Supervisor Wright also asked that consideration be given to the Pasadena-Palmdale cut-off as part of the State system.

ADDING A MILE

The following officers of Joint Highway District No. 17 asked State cooperation in the construction of an additional mile on the westerly end of the Julian-Kane Springs project now under construction: Leroy H. Aul, Henry L. Jackson and George E. Krueger.

Supervisor Tom Turley of San Diego County asked the Commission to consider the early payment of a \$25,000 reimbursement to San Diego County for expenditures made on the State highway near Tia Juana. He also asked that the State recommend allocation of Federal funds to the road from Baxter to Warner Dam through an Indian reservation and Forest Reserve.

J. R. Robinson, C. H. Hutchinson, Mayor W. Pfunder and Irving Knopsnyder comprised a delegation urging the routing of the Valley Boulevard through Colton on I street.

A delegation from the Perris Valley Chamber of Commerce relative to the requested rerouting of Route 78 through Perris included H. M. Harford, Van W. Dodson, V. E. Reynolds, J. W. Kirkpatrick, I. L. Haas, Frank Beatty, C. J. Cutler.

JACK RABBIT TRAIL

Dave Kiler of Mecca appeared relative to the routing of Mecca-Blythe Highway through Box Canyon and was followed by a large delegation from the Riverside Chamber of Commerce introduced by Supervisor J. E. McGregor requesting the realignment and reconstruction to State standard of the Jack Rabbit Trail between Beaumont and Riverside. Supervisor R. E. Dillon presented the matter in detail and the delegation included Mayor Joseph S. Long, T. E. Gore, E. P. Clarke, A. C. Fulmor, A. A. James, Dewitt B. Hutchings, C. D. Hamilton, T. C. Rosenberger, Guy Boghard, A. L. Wood, Mark Potter.

Between the morning and afternoon sessions the Commission and staff were entertained at luncheon at Mission Inn as guests of Mayor John S. L. Long, the City Council and Board of Supervisors of Riverside County. On the following day the official party were guests at a similar function given in their honor by the Lions Club at the conclusion of the bridge dedication ceremonies. Several thousand people gathered at the grandstand for this event to greet and hear Governor Rolph, and the occasion was made doubly impressive as a spectacle by the presence of



A GALA DAY was enjoyed by the people of Riverside on March 29th when Governor Rolph and the California Highway Commission attended ceremonies at the dedication of the newly reconstructed Rubidoux Bridge and the planting of a memorial palm tree on the bridge approach. No. 1 shows the Governor leading the parade to the bridge in a car. No. 2 pictures the fine, wide, bridge roadway and No. 3 reveals part of the great throng at the celebration. In No. 4 the Governor is seen preparing to plant the big tree shown being lifted into place in No. 5. In No. 6 is the scene at the grandstand with Governor Rolph speaking.

Plan to Make Old Bottleneck Bridge Serve as Detour While Being Rebuilt

By **M. A. KOONTZ**, Designer, Bridge Department

THE Bridge Department is now engaged in the preparation of plans and specifications for the reconstruction and widening of the existing bridge across Ventura River at the city of Ventura. The project together with grading and paving of the bridge approaches will be advertised in May of this year.

Two prime considerations have made it expedient at this time to widen and reconstruct the present bridge, namely, present and future traffic requirements, and deterioration of superstructure of the existing bridge.

TRAFFIC BOTTLENECK

All north-bound traffic on Route 2 (Roosevelt Highway) and Route 60, (Coast Highway) together with local north-bound traffic, must cross Ventura River by way of the present bridge. This traffic volume now somewhat exceeds the safe traffic capacity of the existing two-lane structure. Estimates of future traffic indicate that by 1940 the present two-lane structure will be totally inadequate.

Future traffic requirements, together with the close proximity of the city of Ventura, dictate that the existing two-lane structure should be widened to provide four lanes.

The present bridge as now existent consists of a series of eight concrete deck arch spans and four concrete deck girder spans providing a clear roadway width of 20 feet. The eight arch spans consisting of two 115-foot and six 120-foot spans were constructed by Ventura County in 1913. In 1914 the bridge approaches were washed out by flood and replaced with timber trestle. By 1924 the timber trestle was in such condition as to require replacement, which the State did with three 60-foot and one 30-foot reinforced concrete girder spans.

MUCH REPAIRED

Time, aided by poor concrete, has made great inroads on the existing arch spans. Much repair has been required to maintain the arch spans in usable condition, since failure has occurred at many points including the slab and railing.

Economic considerations urged the incor-

poration into the new structure of whatever portions of the existing structure were suitable and practicable.

A further requirement was that there be a detour that could not be washed out by flood water with consequent tie-up of all coastwise traffic and its attendant difficulties. Hence the existing bridge is to be used as a detour during construction operations.

USING OLD PIERS

In order to meet the above requirements, a bridge was designed which, while not utilizing any of the superstructure—on account of its deteriorated condition—does make full use of the substructure of the present bridge. The existing arch span piers will be cut off at ground line and used as footings for new piers. The existing girder span piers with minor alterations will be used as now existent.

To allow the use of the old bridge as a detour the new bridge was designed so that it may be constructed in separate halves. The contractor will construct on the downstream side of the existing bridge one-half of the proposed bridge, meanwhile maintaining two-way traffic over the present bridge. **This half bridge, with a temporary railing at the ultimate centerline, will provide a detour while the existing bridge is being removed and the upstream half is being constructed—use being made of the old piers as mentioned above.**

FOUR-LANE ROAD

Upon completion of the upstream half, the temporary railing will be removed and there will then be opened to traffic a 44-foot roadway with 5-foot pedestrian walks at each side.

This new structure will consist of two 40-foot, thirteen 60-foot, and three 64-foot reinforced concrete deck girder spans with an aggregate length of 1233 feet founded on concrete piers and abutments.

In view of the close proximity of the city of Ventura special attention has been given to esthetic details one of which is an ornamental electric lighting system.

This project is a cooperative one with the city of Ventura constructing connections making easy access to the bridge.

Provides for Traffic and Pedestrians



PROPOSED VENTURA RIVER BRIDGE

Reconstruction of Roosevelt Highway Link Half Completed

GRADING and paving the approaches, one-half mile in length, to the new steel and concrete bridge across the Salinas River at Bradley is complete. This is a 20-foot reinforced concrete pavement on a 36-foot roadbed.

On the Roosevelt Highway between San Remo Divide and Rocky Creek, a distance of 8.3 miles, the old road, taken over by the State from Monterey County, is being reconstructed on new alignment with a roadbed 24 and 30 feet in width with a selected material surface 20' x 8". This project is 50 per cent complete.

Plans are complete for the reconstruction of a portion of the road from San Remo Divide to the Carmel River, a distance of 3.7 miles. This is through the Carmel Highlands, an improved residential section.

On the Roosevelt Highway south of Carmel at Bixby Creek a reinforced concrete arch bridge is about 70 per cent complete, being constructed under the supervision of the Bridge Department.

Bids have been received on a reinforced concrete arch bridge across Rocky Creek, on the

Roosevelt Highway, about one-half mile north of Bixby Creek. The completion of this structure with the work now completed or under contract will open a new road into the Big Sur country that will be much easier and safer to travel than the old road.

New maintenance buildings including a residence for the Maintenance Superintendent have been completed at Salinas.

Carleton Named to National Legal Body

The Executive Committee of the American Association of State Highway Officials has decided to create a new committee on Legal Affairs.

It is expected that this committee will develop matters that will be of great assistance in coordinating legal procedure helpful to the State Highway Departments of the various states of the Union.

C. C. Carleton, attorney at law, Chief of the Division of Contracts and Rights of Way, California Department of Public Works, has been named a member of the new committee.

THE "YES" MAN

Muggins—What did the traffic cop say to you?
Chuggins—I haven't the faintest idea. I was so busy saying "Yes, sir" that I couldn't hear him.—*Motor Land.*

Prospect: "I want to pay cash for this car."
Auto Dealer: "Yes, sir, but this request is so unusual that I am afraid you will have to give us references."—*Motor Trader.*

Highway Bids and Awards for March

AMADOR, CALAVERAS, TUOLUMNE AND STANISLAUS COUNTIES—Applying oil to 180 roadside miles for weed eradication. Dist. X. C. W. Wood, Stockton, \$2,846; L. J. Immel, Berkeley, \$3,351; Dee Strong, Rio Vista, \$2,277; Basalt Rock Company, Inc., Napa, \$3,189; Tiffany-McReynolds-Tiffany, San Jose, \$3,042. Contract awarded to Oilfields Trucking Co., Taft, \$2,028.

FRESNO, TULARE AND KERN COUNTIES—Furnishing and applying oil to roadside vegetation, about 85 miles. Dist. VI. Pacific Tank Lines, Inc., Los Angeles, \$7,139; Fred W. Nighbert, Bakersfield, \$4,212; Stewart & Nuss, Inc., Fresno, \$4,471; Oilfields Trucking Co., Taft, \$4,492. Contract awarded to Basalt Rock Company, Inc., Napa, \$4,104.

LOS ANGELES COUNTY—Dist. VII, Rt. 59 and 61. Treating about 2 miles between Neenach School and Neenach with fuel oil, and about 4.1 miles between La Canada and Fern Canyon with road oil and screenings. Square Oil Co., Los Angeles, \$3,676; J. J. Lilley, Fullerton, \$3,706; H. E. Cox & Son, Pasadena, \$3,936; A. O. Nelson, Pasadena, \$4,905. Contract awarded to Oilfields Trucking Co., Taft, \$3,589.

LOS ANGELES COUNTY—Between Santa Inez and Santa Monica canyons, about 2.4 miles to be graded and paved with asphalt concrete. Dist. VII, Rt. 60. Sander Pearson, Santa Monica, \$169,556; Ed Johnson & Sons, Los Angeles, \$157,661.80; L. A. Paving Co., Inc., Los Angeles, \$182,677; Hall-Johnson Co., Alhambra, \$185,284; Macco Construction Co., Inc., Clearwater, \$164,085; George R. Curtis Paving Co., Los Angeles, \$161,987; Gibbons and Reed Co., Burbank, \$176,677; Southern Cal. Roads Co., Los Angeles, \$163,374. Contract awarded to Griffith Company, Los Angeles, \$148,830.

LOS ANGELES AND VENTURA COUNTIES—Furnishing and spraying oil on roadside vegetation. Dist. VII. Consumers Oil Co., Los Angeles, \$2,349; Seaside Oil Co., Summerland, \$2,454; Gilmore Oil Company, Ltd., Los Angeles, \$3,015; Pacific Tank Lines, Inc., Los Angeles, \$3,213. Contract awarded to Square Oil Company, Inc., Los Angeles, \$2,268.

LOS ANGELES, ORANGE, SAN DIEGO AND IMPERIAL COUNTIES—Furnishing and spraying oil on roadside vegetation. Dist. VII. Consumers Oil Co., Los Angeles, \$2,368; Gilmore Oil Company, Ltd., Los Angeles, \$2,936; Pacific Tank Lines, Inc., Los Angeles, \$3,024. Contract awarded to Square Oil Company, Inc., Los Angeles, \$2,016.

MENDOCINO-HUMBOLDT COUNTIES—Between Ridgewood and Stephens Grove, Roadside oiling of vegetation, 56 miles. Dist. I, Rt. 1. Basalt Rock Co., Napa, \$1,512; Smith Bros. Co., Eureka, \$1,708; Oilfields Trucking Co., Taft, \$1,176. Contract awarded to Chas. Kupping, Lakeport, \$912.

MENDOCINO, SONOMA, MARIN, SOLANO, LAKE AND NAPA COUNTIES—Furnishing and spraying oil on roadside vegetation, about 106 miles. Dist. IV. O. V. Freeman, Palo Alto, \$6,488; Basalt Rock Co., Napa, \$5,607; Oilfields Trucking Co., Taft, \$6,728; Skeels-Graham Co., Roseville, \$7,128; The A. Helwig Construction Co., Sebastopol, \$6,795; C. F. Frederickson & Sons, Lower Lake, \$6,621. Contract awarded to Chas. Kupping, Lakeport, \$5,580.

MONO COUNTY—Across West Walker River about 24 miles north of Bridgeport, R. C. Bridge of 3-30' 0" spans on concrete bents and abutments with wing walls. Dist. IX, Rt. 23. J. W. Terrell, Sacramento, \$29,910; J. W. Hoopes, \$19,209; Nelson Bros, Escalon, \$21,812; Robinson-Roberts Co., Los Angeles, \$19,920; Schuler & McDonald, Inc., Oakland, \$21,463; F. H. Neilson, Orland, \$19,665; Nevada Contracting Co., Fallon, Nevada, \$21,734; Lord & Bishop, Sacramento, \$24,845. Contract awarded to Carl Ingalls, Inc., Bakersfield, \$14,633.

ORANGE COUNTY—Bridge across Anaheim Bay near Seal Beach. 1-55' plate girder span and 11-30' R. C. girder and 11-30' R. C. girder spans to be widened. Dist. VII, Rt. 60. Merritt Chapman & Scott Corp., San Pedro, \$53,529; R. R. Bishop, Long Beach, \$68,984; R. H. Travers, Los Angeles, \$72,887; Herbert M. Baruch Corp., Ltd., Los Angeles, \$63,885; Oberg Bros., Los Angeles, \$58,495; Everts & Dunn, Los Angeles, \$57,742. Contract awarded to Nead Construction Co., Wilmington, \$49,982.

RIVERSIDE COUNTY—Between Shavers Summit and Desert Center, about 19.5 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. VIII, Rt. 64, Sec. B. Morrison-Knudsen Co., Los Angeles, \$612,057; George Herz & Co., San Bernardino, \$559,659; Macco Construction Company, Inc., Clearwater, \$599,771; R. E. Hazard Contracting Co., San Diego, \$580,835; New Mexico Construction Co., Albuquerque, New Mexico, \$609,042; V. R. Dennis Construction Co., San Diego, \$572,021; H. W. Rohl Co., Los Angeles, \$548,554; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$595,802; Ralph Pleasant Construction Co., Phoenix, Arizona, \$579,714; Von der Hellen & Pierson, Castaic, \$616,096; A. Teichert & Son, Inc., Sacramento, \$643,176; Granite Construction Company, Ltd., Watsonville, \$561,910; Hanrahan Co., San Francisco, \$615,698; Jack Casson, Hayward, \$623,242. Contract awarded to Basich Brothers, Torrance, \$528,678.

SAN BENITO, MONTEREY, SAN LUIS OBISPO AND SANTA BARBARA COUNTIES—Furnishing and spraying oil on roadside vegetation. Dist. IV. Bradley Truck Co., Santa Maria, \$9,116; Fred W. Nighbert, Bakersfield, \$10,560; Oilfields Trucking Co., Taft, \$8,060; Pacific Tank Lines, Inc., Los Angeles, \$9,757. Contract awarded to Western Motors Transfer, Inc., Santa Barbara, \$7,568.

SAN BERNARDINO COUNTY—Between Upland and San Bernardino, removing dead trees from right of way. Dist. VIII, Rt. 9, Secs. A, B, C. Fred Jackson, San Bernardino, \$627; Harry M. Rouse, San Bernardino, \$461; Chas. E. Moore, Ontario, \$737; Chas. Berkowitz, Riverside, \$418; H. S. Littlefield & G. W. Prong, San Bernardino, \$891; Carl S. Rousseau, Pasadena, \$551; Edwin Anderson, San Francisco, \$2,090; W. D. Bohan, San Bernardino, \$2,280. Contract awarded to Arthur Hubbs, Colton, \$188.

SAN BERNARDINO COUNTY—Erecting maintenance station buildings at the Panorama Maintenance Station. Dist. VIII, Rt. 43, Sec. A. J. W. Cramp, San Bernardino, \$12,473; Wm. G. Gannon, Pomona, \$12,483; C. H. Want, Los Angeles, \$12,700; Bakker & Robinson, San Bernardino, \$12,920; John Strona, Chino, \$13,392; Fred Walsh, San Bernardino, \$13,800; Martin Green, San Bernardino, \$14,447. Contract awarded to Arthur Cox, Pasadena, \$10,129.

SAN BERNARDINO COUNTY—Water supply well complete in place at Yermo Maintenance Station. Dist. VIII, Rt. 31, Sec. H. W. D. Anderson, San Bernardino, \$1,162; J. W. Burkhardt, Victorville, \$1,087; W. A. Rice, Riverside, \$2,407. Contract awarded to Lyon Bros., Los Angeles, \$937.

SAN DIEGO COUNTY—Erection of maintenance station buildings and fence at Escondido. Dist. VII. C. M. Martin, Escondido, \$5,749; J. B. McIntosh, Los Angeles, \$5,951; John A. Malloy, Los Angeles, \$5,956; S. Giannone, Los Angeles, \$6,299; K. W. Wellington, Escondido, \$6,486; Walter Treppe, San Diego, \$7,450. Contract awarded to J. A. Hunt, East San Diego, \$5,593.

SAN MATEO, ALAMEDA, SANTA CRUZ, SANTA CLARA AND CONTRA COSTA COUNTIES—Furnishing and spraying oil on roadside vegetation, about 80 miles. Dist. IV. Oilfields Trucking Co., Taft, \$5,100; Skeels & Graham Co., Roseville, \$4,634; O. V. Freeman, Palo Alto, \$4,141; Air-o-Spray Equipment Co., San Jose, \$5,100; Tiffany-McReynolds-Tiffany, San Jose, \$3,946; W. H. Larson, Berkeley, \$4,230. Contract awarded to Dee Strong, Rio Vista, \$3,663.

STANISLAUS, SACRAMENTO, SAN JOAQUIN, AMADOR AND CALAVERAS COUNTIES—Applying oil to 148 roadside miles for weed eradication. Dist. X. C. W. Wood, Stockton, \$2,646; Basalt Rock Company, Inc., Napa, \$3,402; Oilfields Trucking Co., Taft, \$4,510; Dee Strong, Rio Vista, \$3,307; E. F. Hilliard, Sacramento, \$4,498; O. V. Freeman, Palo Alto, \$2,872; Tiffany-McReynolds-Tiffany, San Jose, \$3,830; Rotary Oil & Burner Co., Sacramento, \$3,389. Contract awarded to Lee J. Immel, Berkeley, \$2,499.

TEHAMA, SHASTA, SISKIYOU AND LASSEN COUNTIES—Applying Diesel oil to roadside vegetation over a distance of about 94 miles. Basalt Rock Company, Napa, \$4,460; E. F. Hilliard, Sacramento, \$5,274. Contract awarded to Oilfields Trucking Co., Taft, \$4,460.

WATER RESOURCES

*Official Report
As Of
April 1, 1932*

EDWARD HYATT, State Engineer

Approval by the county supervisors of a petition for the organization of the Elsinore Water Conservation District comprising an area fronting on Lake Elsinore in Riverside County and the issuance of an order authorizing the use of the Big Tujunga Dam, an important unit in the Los Angeles Flood Control System are two of the interesting news items in the report of State Engineer Edward Hyatt covering activities of the Division of Water Resources for March. Other matters affecting dams, irrigation districts, reclamation projects, snow surveys, etc., are detailed in the report as follows:

A resolution dated March 14, 1932, by the supervisors of Riverside County, approving the sufficiency of a petition for the organization of the Elsinore Water Conservation District, was received by the State Engineer with the request for a report on the proposed district. The area proposing to organize adjoins the town of Elsinore on the west, and fronts the lake in the beautiful Elsinore Valley near the west line of Riverside County.

Visits for the purpose of conference or investigation of matters connected with the 1931 report on irrigation districts were made to the following districts: Tranquillity, James, Stinson, Riverdale, Laguna, Consolidated and Fresno irrigation districts, Fresno County; Alpaugh, Vandalia, Lindsay-Strathmore and Tulare irrigation districts, Tulare County; Island No. 3 irrigation district, Kings County; Merced and El Nido irrigation districts, Merced County, Turlock, Modesto and Oakdale irrigation districts, Stanislaus County; South San Joaquin and Woodbridge irrigation districts, San Joaquin County; and Camp Far West Irrigation District, Placer County.

The directors of the South San Joaquin Irrigation District appeared before the California Districts Securities Commission with a request for the reallocation of funds received from power sales, under section 32d (1931) of the Irrigation District Act. The Commission decided that since such revenues had already been allocated by the district under the contract of 1925 with the power company they were a direct obligation to the bonds of the issue voted for and used in the construction of the Melones Dam, and that the act of 1931 could not be used to modify this obligation.

DAMS

To date 793 applications have been received for approval of dams built prior to August 14, 1929; 93

for approval of plans for construction or enlargement and 250 for repair or alterations.

Applications Received for Approval of Plans for Repair or Alteration.

Fourteen such applications were received during this period from all sections of the State, indicating the willingness of owners to place their dams in condition for approval prior to the date fixed by law for such approvals, i.e., August 14, 1932.

Plans were approved for the construction of the Greenspot Dam, an earthfill dam to be built by the Western Fruit Growers in San Bernardino County.

Plans Approved for Repairs or Alterations.

Dam	Owner	County
Mill Creek	Coast Counties Gas & Elec. Co.	Santa Cruz
Medley Lake	Pacific Gas and Electric Co.	El Dorado
Finnon	Pacific Gas and Electric Co.	El Dorado
El Dorado Forebay	Pacific Gas and Electric Co.	El Dorado
Upper Cleese	John P. Cleese	El Dorado
Millbrae No. 1	Mills Estate Inc.	San Mateo
Bowles	Claremont Pines Corporation	Alameda
Hart	E. C. and Kate C. Hart	Siskiyou

Plans were approved for removal of the Montezuma Dam, owned by the Pacific Gas and Electric Company in Tuolumne County.

An order authorizing use of the Big Tujunga Dam was issued to the Los Angeles County Flood Control District. This is a 180-foot concrete variable radius arch dam on Big Tujunga Creek built by the Los Angeles County Flood Control District and is an important unit in the system of flood control dams being built by the district.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period there have been no activities other than routine maintenance work. Maintenance clearing in the Butte Slough and Tisdale by-passes was terminated on February 22d after a total of \$23,000 had been expended in such work this season.

The maintenance headquarters near Sutter City has been practically completed, only certain finishing work remaining to be done. Moving in has been commenced and will be completed within ten days.

There has been practically no rainfall during this period and the drainage pumping plants on the Sutter By-pass have not been operated.

Sacramento Flood Control Project.

A crew consisting of approximately sixty to seventy men was placed at work on construction clearing on February 19 and continued to March 12, when the fund of \$5,800 provided by the Reclamation Board was exhausted. At this time no channel clearing work is in progress.

Emergency Bank Protection Begun

(Continued from preceding page)

A contract has been entered into with Samuel Ewell of Marysville for clearing and grubbing 13 acres in the Feather River bottoms about five miles north of Marysville.

Emergency Flood Protection and Rectification of Rivers.

River rectification work on Bautista Wash, a tributary of the San Jacinto River, in cooperation with Riverside County and landowners has been commenced. This work will cost \$1,500.

Arrangements have been completed and work will commence at once on emergency bank protection at three points on the left bank of the San Joaquin River between the Mossdale Bridge and the Banta-Carbona intake, in cooperation with a group of landowners organized as the San Joaquin River Association. This work will cost between four and five thousand dollars.

Sacramento Flood Control Project—Bank Protection.

No work of this class is under way at the present time. The work contemplated by Reclamation District No. 730 at Russell Bend and Reclamation District No. 70 at Girdner Bend has not proceeded, and it is apparently the intention of these districts to postpone work. This is due to the financial condition of the districts.

Navarro River.

Preparations are complete for the placing of 300 tons additional rock on the jetty at the mouth of the Navarro River for the Fish and Game Commission. This work will be completed by April 1.

Russian River Jetty.

During this period work is being confined to repairing the damage done by the storms of last December, particularly to the steel trestle. It has been possible to carry on this work only during good weather and low tide and it has consequently been slow. It is the intention to make things secure and defer further construction until after good weather is insured, some time during the month of May.

Captain C. A. Nelson, construction foreman on the jetty, was killed on March 2, 1932, by falling from a cable. J. P. Kelly, river foreman, is in temporary charge of the work.

Flood Measurements and Gages.

The valley streams have been at an unusually low stage for this season of the year, and no discharge measurements have been made. Continuous records of water heights have been kept at the various stations maintained by this office, and in the office the compilation of records has been continued.

WATER RIGHTS

Applications to Appropriate.

Fourteen applications to appropriate water were received during February; 12 were canceled and 13 were approved during the same period. Seven per-

mits were revoked and the rights under 13 were confirmed by the issuance of a license.

Among more important applications received was one filed by Robert D. Nicol and C. M. Carter of Oakland, California, proposing appropriations from Big Granite Creek and other tributaries of North Fork of American River in Placer County for power and domestic purposes at an estimated cost of \$500,000. Among the more important applications approved was one by Central Pacific Railway Company proposing an appropriation from Donner Creek in Nevada County for industrial and domestic purposes at an estimated cost of \$30,000, and another by O. J. Laing of Paradise, Butte County, proposing an appropriation from springs tributary to West Branch of North Fork of Feather River for placer mining purposes at an estimated cost of \$10,000.

ADJUDICATIONS

Shasta River (Siskiyou County)—Case pending in the Superior Court of Siskiyou County.

Whitewater River (San Bernardino and Riverside counties)—Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

North Cow Creek (Shasta County)—A decree defining the water rights on North Cow Creek, based upon the amended stipulation for judgment heretofore signed by all parties, has been prepared by the Division upon request of the Superior Court of Shasta County, and is being circulated among counsel.

Oak Run Creek (Shasta County)—Case pending in the Superior Court of Shasta County awaiting the entry of a decree in the North Cow Creek case.

Clover Creek (Shasta County)—Action on the case in the Superior Court of Shasta County is pending the outcome of negotiations for settlement by stipulation.

Butte Creek (Siskiyou County)—Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Davis Creek (Modoc County)—Case pending in the Superior Court of Modoc County awaiting entry of Court's decree.

Deep Creek (Modoc County)—A schedule of allotments for trial distribution during the 1932 irrigation season was prepared and submitted to the water users for approval at a meeting held on March 15, 1932, at Cedarville.

Franklin Creek (Modoc County)—A stipulation for consent judgment was submitted to the water users at a conference held at Alturas on March 14, 1932.

New Pine Creek (Modoc County)—A stipulation for consent judgment was submitted to the water users at a conference held at New Pine Creek on March 16, 1932.

Eagle Creek (Modoc County)—A schedule of allotments for trial distribution of the waters of the

Snow Survey Results Above Normal

(Continued from preceding page)

stream for the 1932 irrigation season was submitted to the water users at a conference held at Eagleville on March 15, 1932.

South Fork Pit River (Modoc County)—The case of W. E. Armstrong, et al. vs. Frank McArthur, et al., involving the rights to the use of the waters of the South Fork of Pit River and its tributaries above the confluence of Pine Creek was referred to the Division by the Superior Court of Modoc County by Order of Reference dated February 29, 1932. The determination covers an irrigated area of approximately 19,400 acres served by some 45 diversion conduits.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work on this project in the past month has been in compilation of the annual report which will present all 1931 data on the diversions, stream flow, return flow, use of water, salinity, etc., for the Sacramento-San Joaquin territory. This involves the computation of daily, monthly and seasonal diversions of water by some five hundred pumping plants. Good progress has been made. Work has continued on the special report of damage in 1931 due to salinity and water shortage.

Sampling at nineteen permanent salinity stations in the Upper Bay and Delta regions and operation of tide gages has been maintained. There is now practically no salinity in the Delta channels. Tests of samples taken on March 10 were as follows:

SALINITY-UPPER BAY AND SACRAMENTO-SAN JOAQUIN DELTA

Station	Salinity in parts of Chlorine per 100,000 parts of water
Point Orient.....	1300
Point Davis.....	640
Bullshead	180
Bay Point.....	16
O. and A. Ferry.....	4
Collinsville	2
Antioch	4
Emmaton	2
Jersey	4
Central Landing.....	1
Middle River P. O.....	3

CALIFORNIA COOPERATIVE SNOW SURVEYS

The season's second series of surveys at the key snow courses throughout the State were completed in late February and early March by the various cooperating agencies working under the State's supervision. The results of the surveys as well as all precipitation data available to March 1st were reported in the March 1st Snow Survey Bulletin.

There were no general storms over the Sierra in February subsequent to the one ending in the first

few days of the month and this resulted in considerable melting of the snow at low elevations and a marked solidification and increased density of the pack at the higher elevations. In general, the surveys indicated a depth and water content of the snow to March 1st from two to four times greater than the depth and water content of a year ago.

For a few courses, only, the period of record of the surveys has been sufficient to permit of the development of normals. Of these, three in Yuba Basin indicated an average water content of the snow to March 1st amounting to 116 per cent of the normal for the entire season (up to April 1st) and Blue Lakes on the Mokelumne-Carson divide, Rhinedollar Lake, close to the Tuolumne-Mono divide, and Mammoth Pass on the San Joaquin-Owens divide showed respective water contents of 113, 123 and 124 per cent of the entire season normal.

The amount of snow reported on the ground at Donner Summit on March 1st was 110 inches. This was 12 per cent above a 33-year average for this date of 98 inches. In ten of the years in the period from 1898 to date the depth on March 1st has exceeded 110 inches and a maximum March 1st depth of 215 inches was recorded in 1911.

The data from the precipitation stations showed, in general, a progressive increase in the percentages of normal to March 1st in going from the northern to the southern stream basins, thus: The average precipitation up to March 1st was from 10 to 15 per cent below normal in the Upper Sacramento, Pit, McCloud and Feather River basins; from 5 to 10 per cent above normal in the basins from Yuba to Stanislaus; about 30 per cent above normal in the Tuolumne and Merced basins; from 45 to 50 per cent or better above normal from Upper San Joaquin to Kern basin; and from 60 to 90 per cent, with a general average of about 75 per cent above normal in the Los Angeles, San Gabriel and Santa Ana basins. A comparison with the corresponding percentages on February 1st showed that during February the precipitation in the northern basins fell from above to below normal; maintained about the same percentage above normal or fell slightly in the central basins; and considerably increased the percentage above normal in the basins of the south. As an average for the eastern basins, the data indicated precipitation to March 1st varying from 20 per cent above normal in the Tahoe-Truckee and Mono basins to 100 per cent above normal in the Owens basin.

The main surveys at all snow courses in the State will take place at the last of March and the April 1st bulletin will present the forecasts of the April-July stream flow and seasonal water supply as determined from the snow survey and precipitation data.

Irrigation Investigations—Federal Cooperation.

In connection with the Federal-State cooperation for irrigation investigations an agreement was reached and program drawn up covering the future work in the Sacramento-San Joaquin Delta. This includes a continuation of studies of the consumptive use of water by tules, aquatic plants, weeds and other non-economic growths of the delta and the evaporation from bare soil and open water surfaces.

(Continued on page 36)

New Salinas River Bridge at Bradley Built With Novel Widening Features

By H. E. FERNALL, Resident Engineer

THE RECENT completion and opening to traffic of the Salinas River Bridge near Bradley on the Coast Highway between San Francisco and Los Angeles marks the completion of another unit in the general program of reconstructing the old and inadequate structures on the Coast Highway. The old bridge at Bradley has long been a barrier to traffic due to its poor alignment, narrow width and structural weakness.

The construction of the new bridge was necessitated by the unsafe condition of the old bridge which had been designed originally for the light traffic demands of the late eighties and was entirely inadequate for modern high speed traffic and present day truck loads. Before the new structure could be completed it was necessary to have watchmen at each end of the bridge to restrict the speed of all vehicles and to issue special permits for all trucks restricting their speed and load limit.

NARROW ROADWAY

The old structure consisted of three timber trusses 114 feet long built in 1883 and four light steel trusses 110 feet long which were erected in 1915 to replace old wooden spans that had been carried away by high water. The minimum roadway width between curbs was only 15 feet. At the west end of the structure there was a sharp dangerous curve which was the contributing cause of numerous serious accidents.

To avoid these unsafe conditions, it was necessary to construct the new bridge at a new location. The new structure is about 600 feet downstream from the old bridge on an alignment amply adequate for the trunk line traffic demands of this era.

The new bridge, built at a cost to the State of approximately \$275,000, is 1666 feet in length and has a roadway width of 24 feet. It consists of eighteen 45-foot reinforced concrete girder spans resting on reinforced concrete caps and columns and six 140-foot steel deck spans supported by heavy reinforced concrete piers.

This type of bridge was adopted not alone for economy but also for ease in future widening. The volume of traffic at this location

does not demand more than a two-lane width, and in so far as future traffic needs can be predicted a two-lane width will be adequate for some years. Consequently it was not deemed necessary from an economic standpoint to construct a wider bridge at this time.

When the decks of the concrete span were poured, a strip of concrete seven by six inches along the outer edge of each floor slab was omitted. Long hook dowels were embedded in the slab and extended into this unpoured strip to be used as anchorage in future widening. After the concrete in the deck was thoroughly cured, the unpoured strip together with all the protruding reinforcing steel was given a coat of asphalt paint so that when the strip was poured there would be very little bond between this strip and the remainder of the slab.

EASY TO WIDEN

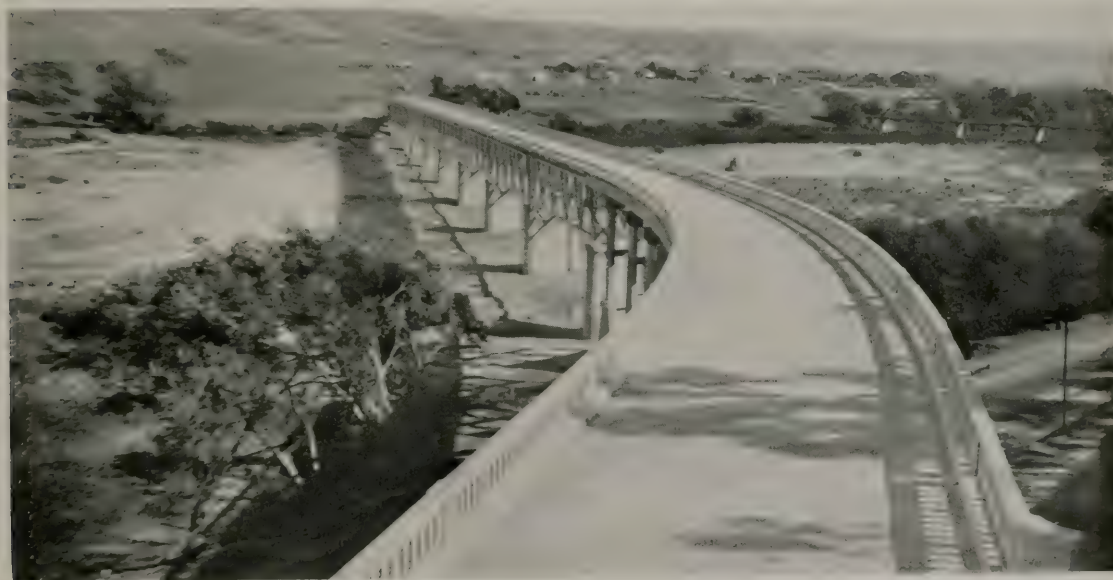
By this means, when it is deemed necessary to widen the bridge, this removable strip of concrete can very readily be taken out. The caps were also poured with a removable strip and the floor beams in the steel spans are all punched ready to be spliced for future widening. The reinforced concrete railing was constructed in sections bolted to the slab in such a manner that they can be lifted out and then replaced on the newly widened deck.

All of the excavation for piers in the river channel was wet excavation as the water was within approximately one foot of the surface. Cofferdams built of steel sheet piling were used and gave excellent results. The material encountered in the different piers was practically the same for each pier, consisting of sand and gravel, then a layer of black mud with strata of clay, coarse gravel and boulders. The material encountered at the west end of the structure consisted of compressed clay with layers of cemented gravel. Each pier is supported by Douglas fir piling. The footings of all bents of the reinforced concrete girder spans with the exception of bents 23, 24 and 25 rested on reinforced concrete piles.

In order to meet with the alignment of the new highway, all of the spans at the west end



DECREPIT AND DANGEROUS, this old bridge on the Coast Route over the Salinas River at Bradley, with its 15-foot roadway, shaky wooden spans and sharply curved end, has been supplanted by a modern structure.



PERENNIAL YOUTH seems assured for this new concrete structure at Bradley by novel features that will permit the easy widening of its 24-foot roadway to meet future traffic conditions on the busy Coast Highway.

of the structure are built on a 1095-foot radius curve, superelevated for high speed traffic. The bridge is constructed on a grade of approximately 0.94 per cent with flat vertical curves at each end. These features so essential to present and future traffic requirements are designed to meet the demands of motor vehicle traffic and give the greatest benefit through a reasonable expenditure of funds.

A PROBLEM IN ANATOMY

The pavement was wet from a recent rain, and as the motorist swung 'round the corner his car skidded out of control, crashing into a butcher's delivery cart. As soon as he could bring his car to a stop, the motorist jumped out and ran back to where the butcher's boy was excitedly surveying the damage.

"I say, my boy, are you hurt much?" the motorist asked.

"No-o, I guess not," the boy answered, "but I can't find my liver!"—*Motor Land*.

A patrol wagon isn't much of a car, but it'll do in a pinch.

U. S. Contribution to Aid Water Plan

(Continued from page 33)

WATER RESOURCES

South Coastal Basin Investigation.

The South Coastal Basin Investigation is proceeding in a routine manner. Material for a bulletin on water levels has been assembled and is about ready to be placed in the hands of the printer. This will be a manual on water levels and should prove of great value in portraying conditions over the past.

Mohave River Investigation.

This investigation has proceeded in a routine way. The run-off has been much heavier than has been the case in past years of the investigation and more valuable data have been secured.

Salinas Valley Investigation.

The winter has been a very wet one in the Salinas Valley and excellent data as to run-off, percolation and movement of underground water levels have been secured. The work is now proceeding along regular lines.

Ventura County Investigation.

The rainfall in the Ventura County area has been above normal and in contradistinction to conditions during the past three years of the investigation, excellent data have been secured which will give better indications of the possibilities than have been secured in the prior years of the investigation.

Pit River Investigation (Modoc and Lassen counties).

Good progress has been made this month on the work of the report covering the three years investigation of the Pit River.

A report entitled "Supervision of Diversions from Pit River and Rattlesnake Creek in Hot Springs Valley, Modoc County, California, 1931 season" has been completed. This report covers the distribution of water in Hot Springs Valley during the 1931 irrigation season.

Santa Clara Valley Investigation.

The unusual rains occurring during the early part of February and immediately preceding afforded an opportunity for observing the contributions of the various smaller streams tributary to the Santa Clara Valley and the waste of those streams into San Francisco Bay. Gagings were made and a record of discharge maintained at a total of 29 stations on San Antonio Creek, Permanente Creek, Stevens Creek, Calabazas Creek, San Tomas Creek, Campbell Creek, Silver Creek, Dry Creek, Penitencia Creek and Berryessa Creek.

Percolation tests were made on Guadalupe, Los Gatos, San Tomas, Dry, Berryessa, San Antonio, Calabazas and Campbell creeks and on Coyote River.

The small group of wells which has been under special observation during recent months for the purpose of determining the rapidity with which surface streams contribute to the underground basin was read on January 28, February 11 and February 25.

Napa Valley Investigation.

Dry Creek, Rector Creek, Conn Creek and Napa River were measured during the comparatively high stages. Practically daily gaging was necessary at the temporary stations due to rapidity of changes.

Assembly of pump diversion data covering the irrigation season of 1931 was completed and the information forwarded to Sacramento.

The group of wells which has been under monthly observation was observed on February 26 and 27.

Santa Ana Construction Works.

Work is proceeding on Cucamonga Cone, Deer-Day Creek Cone, Lytle Creek Cone and Waterman and Twin Creek cones. The works being constructed are combined spreading and flood control works and are of considerable magnitude as compared to most works of this nature so far constructed in southern California.

Colorado River.

The agreement of August 18 as to allocation of Colorado River water belonging to areas in California was endorsed by six of the seven interests concerned. The Palo Verde Irrigation District at the time did not agree to the allocation. It has now submitted a proviso to its allocation which has been submitted to the other six parties by this office. The Metropolitan Water District and city of Los Angeles have endorsed the new proviso and it was written into the contract between Imperial Irrigation District and the Secretary of the Interior. The proviso leaves the agreement substantially as it was before and affects only the right of Palo Verde Irrigation District.

STATE WATER PLAN

The California Water Resources Commission held a series of meetings in the State Building, San Francisco, on March 17, 18 and 19, meeting jointly with the Joint Legislative Water Committee on the afternoon of March 18.

On March 17, the California Water Resources Commission was informed of the recommendations submitted in a report made by Lieut. Col. Robins, Division Engineer, Pacific Division, U. S. War Department, to the Chief of Engineers, U. S. Army, concerning the further improvement of the Sacramento, San Joaquin and Kern rivers, California, in the combined interest of navigation, flood control, power development and irrigation. The recommendations made by Colonel Robins are of importance to the State in carrying out the State Water Plan. Lieut. Col. Robins in a public notice dated March 14, 1932, concerning his final report, states in part as follows:

"If the State and/or other responsible local interests will construct the proposed Kennet Reservoir and operate it so as to reduce high water flows on the Sacramento River and to maintain a low water flow of not less than 6000 second-feet between Chico Landing and Sacramento, the report finds that a Federal contribution of about \$7,370,000 to the first cost of the

(Continued on page 39)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 APRIL, 1932 No. 4

CALIFORNIA ROAD ECONOMY

The California Department of Public Works has just made public an interesting and informative survey of the public highway work done in all the states during 1931.

Some thoughtless people consider that California's highway development and maintenance expenditure last year of \$38,073,273, derived from the gasoline tax almost exclusively, is a great amount. Yet nine other states each devoted a larger sum to their roads. Even such commonwealths as New Jersey, Louisiana and Iowa exceeded this State last year in highway costs.

Furthermore, 36 other states exceeded California in total mileage of highway construction last year, while 46 states each expended a greater amount per car in road work than did California.

This State's ten-year plan is systematic and economical and is progressing steadily with the aim of making highway accommodation absolutely adequate for conditions expected to exist in 1942.—*Los Angeles Evening Herald and Express.*

SOWING THE SEED

The extraordinary man who is Governor of California is now disclosed as a spreader of wild flower seed in a big way. At his ranch in San Mateo and Santa Clara counties he has sown acres of poppies and blue lupine in alternating patches. And he tells the "Sacramento Bee":

"Whenever I go on a motor trip in any part of the State I take along a sack of poppy or mixed wild flower seed. I scatter these seeds along the highways, around camping places, in fields and meadows—in fact, any place I think flowers would add to the scenic beauty.

If everyone in California would follow the

Large Traffic Gain for West Indicated by Federal Survey

AS THE RESULT of a survey of traffic on the federal-aid highway system in 11 western states, this area may expect an increase of 45 to 60 per cent in highway traffic during the present decade, according to a report by the Bureau of Public Roads.

The survey was conducted in cooperation with the highway departments of Arizona, California, Colorado, Idaho, Nebraska, New Mexico, Nevada, Oregon, Utah, Washington, and Wyoming. The federal-aid system is approximately 7 per cent of the total rural road mileage in each of these states and is made up of important state and interstate routes.

The purpose of the survey was to obtain essential facts concerning the present density, type, capacity, and distribution of traffic units as a basis for planning highway development to serve present and future traffic. The data obtained is available for use of the states as a basis for preparing a program of road construction, reconstruction and maintenance consistent with traffic requirements for each year up to 1940.

In 1930 it was found that 11.3 per cent of the mileage carried heavy traffic, or more than 1500 vehicles a day; 18 per cent carried intermediate traffic, between 600 and 1500 vehicles a day; and 65.9 per cent carried light traffic, or less than 600 vehicles a day.

For 1935 the indicated figures are 14 per cent, 22.1 per cent, and 59.1 per cent. For 1940 they are 16 per cent, 25 per cent, and 54.2 per cent.

The annual travel of vehicles on the federal-aid highways in the 11 states was found to be 8,400,000,000 miles.

A federal law is now proposed to fix the speed at which parachute jumpers may fall. Why not something on the distances pedestrians may bounce?—*Arkansas Gazette.*

Black lettering on an orange background, the color scheme of automobile license plates in California for 1932, is also the color combination being used this year in Idaho and Kansas.

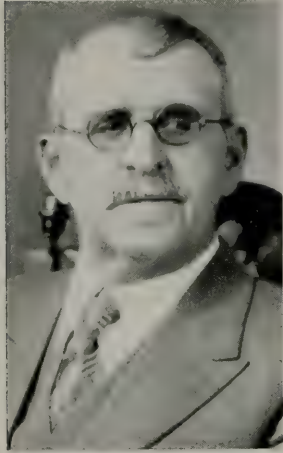
same policy the Golden State would soon be known the world over as the paradise of the wild flowers."

Governor Rolph adds his voice to those who plead for conservation of wild flowers, and says that to deliberately waste them is "almost criminal."—*San Francisco News.*

F. G. Somner, Pioneer District Engineer Retires; J. W. Vickrey Succeeds Him

By T. E. STANTON, Materials and Research Engineer

THE TWENTIETH anniversary of the starting of State highway work in California marks the retirement of Francis G. Somner, District Engineer of District IX, who was appointed District Engineer of District I on January 1, 1912. He will be succeeded by J. W. Vickrey, District Maintenance Engineer of District III, transferred to District I with the title of Acting District Engineer.



F. G. SOMNER

To have served 20 years in a responsible position in any organization is an honor which comes to few but, rarer still, is the honor of so serving an organization which has the record of the State Highway Department of California.

Somner was a man already mature in years when he took up his duties as District Engineer. Born in Dunedin, New Zealand, educated in the grammar schools of Levuka in the Fiji Islands and at the University of California, Somner started his professional career as county surveyor of Plumas County in 1884. In 1886 he became assistant topographer of the United States Geological Survey in Nevada and Placer counties, and in 1887 entered the service of the Southern Pacific Company as level man and transit man on location. He subsequently served the Southern Pacific as assistant engineer and later as road master in charge of tracks, bridges, and buildings in the Red Bluff district.

In 1903 Somner became assistant chief engineer and later chief engineer of the Diamond Match Company during the pioneer stage of the company's operations. He was in responsible charge of location and construction of the Butte County Railroad from Chico to Stirling City—a distance of 31 miles, and also held a commission as United States Deputy Mineral Land Surveyor.

IN AT BEGINNING

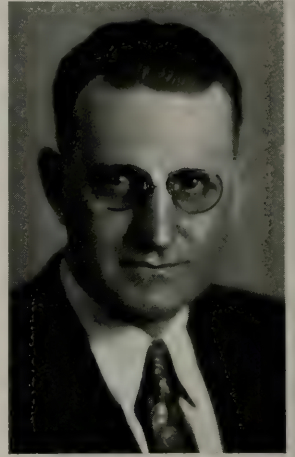
He entered the employ of the State of California when State highway work was first started, and on January 1, 1912, was appointed District Engineer of District I, with headquarters at Willits.

District I comprises all of the California coast counties from Mendocino north through Humboldt and Del Norte to the Oregon line. Twenty years ago this territory was by far the most difficult section of the State in which to locate and build highways, and it demanded its pound of flesh from the hardy engineers who pioneered the work.

The heavy growth beneath the redwoods rendered it impossible to see the ground for any distance ahead—

one of the prerequisites for intelligent and economical highway location. In order to get from one point to another it was necessary for the engineer to get down on his hands and knees and crawl through the saturated underbrush, emerging in the cleared spaces with clothes wet through to the skin.

It was impossible to travel from the Division Headquarters at Willits to the northern part of the district in the vicinity of Eureka and Crescent City except by boat, which had to be taken at San Francisco. Therefore, it required weeks to make the round trip to the northern part of the district and return. How different the situation today and how little, when driving over the broad, well-aligned Redwood Highway which has now been opened for the entire distance along the coast to the Oregon line, do we realize the hardships under which the pioneer road builders of our State had to work.



J. W. VICKREY

EARLY EQUIPMENT

The following interesting incidents may be noted during the period when Somner was located in District I.

The first power shovel owned by the State and engaged in State highway work was purchased for use in District I.

The first and only saw mill owned by the State and used in highway construction was purchased for District I in 1915.

On the south fork of the Eel River, Mendocino County, a double timber arch bridge 155 feet in length spanning a chasm 160 feet in depth was framed on either rim of the chasm and each complete truss swung into place by means of overhead cable, block, and tackle. This structure, together with the methods of erection, was designed in the District I office by Mr. Somner's assistant, F. W. Haselwood, who is now District Engineer of District II. The achievement was at the time announced by the *London Engineering News* as being decidedly unique and original in both design and erection methods.

The first section of road selected to be built by convict labor, after the enactment of the Convict Labor Act in 1915, embraced that portion of the Redwood Highway lying along the south fork of the Eel River and located in Humboldt and Mendocino counties; a length of 75 miles.

Work was commenced in December, 1915, and completed in December, 1918. The country traversed

Built Great Scenic Highway Through a Rugged Virgin Area

(Continued from preceding page)

was as rugged and picturesque as any portion of California, in a virgin state with only a few settlers and inaccessible except by trail built by the engineers during the survey of the road. Crossing of the canyons involved nine bridges of 150 to 300 feet in length and from 130 to 150 feet in height, of original and unique design. A portable saw mill for the production of the timber was sledged in on trail. The press in describing "a great scenic highway" commented as follows:

NEEDED BIG MAN

"It is a fortunate thing for Humboldt that the Division Engineer, Mr. F. G. Somner, is a big man both physically and mentally for none other could have carried through such a work in the time taken. Such engineering work is difficult under the very best of conditions, but when it is realized that the workmen engaged in the undertaking were convicts from San Quentin, inexperienced and an unknown quantity in the labor world, F. G. Somner is to be congratulated on his work of blasting a roadway into Humboldt."

RETIREES VOLUNTARILY

Fatigued and worn by his arduous work in District I Somner, on October 11, 1923, was transferred to Bishop to become District Engineer of the newly created District IX east of the Sierra Nevadas, where he has since served as District Engineer, and has endeared himself to the residents of that section of the State.

Several years ago he was taken with an illness which required a serious operation, since which time he has found it difficult to perform the duties of his position in the vigorous manner with which he was accustomed to work during the previous period of his service. He is, therefore, retiring voluntarily to a well-earned rest.

This abiding faith in mankind, sense of humor, and charity towards all has endeared Somner to all with whom he came in contact, and it is with sincerest regret on the part of all that we say to him "hail and farewell."

ROSE FROM RANKS

J. W. Vickrey who takes Somner's place at District IX headquarters in Bishop as Acting District Engineer is a young man who has won his way up from the ranks by his technical and executive ability to a high place in the esteem of his superior officers.

After graduating from Los Angeles Polytechnic School and spending two years at college he began his engineering career as a rodman and transitman in the service of Los Angeles County and the Southern Pacific Railroad. He entered the State's service as a transitman in District I under Somner, the man he is succeeding. Transferred to District III he rose through the grades of chief of party and locating engineer; construction engineer, assistant district engineer and maintenance engineer in which latter capacity he has served for the last four years.

Her Father—"You wish to wed my daughter—my answer depends on your financial position."

Suitor—"What a coincidence—my financial position depends on your answer."—*The Ground-hog.*

AUTOS AND ROADS KEPT 8,000,000 MEN AT WORK IN 1931

Even during the quiet of 1931, the automobile kept 4,000,000 directly at work and an additional 1,000,000 men busy supplying raw materials. Highway and street building employed 1,000,000 workers directly and the labor of 2,000,000 others was required in supplying equipment and materials. But if during the last few years highway construction had lagged, no one knows how much more serious economic conditions would be at present.

Frederick E. Everett, President,
American Association of State
Highway Officials.

REPORT OF WATER RESOURCES APRIL 1, 1932

(Continued from page 35)

reservoir will be justified in the interest of navigation and flood control. The report also finds that, in the interest of navigation, the proposed transfer of water by pumping from the Sacramento Valley southward should be required to be made through a series of navigable pools in the San Joaquin River between Stockton and Mendota, with suitable locks installed at the dams forming these pools. If this is done the United States will be warranting in contributing about \$4,000,000 to the first cost of the locks and dams and in assuming their maintenance and operation."

On March 19, Governor James Rolph, Jr., attended the meetings of the California Water Resources Commission and the Joint Legislative Water Committee, which bodies have under consideration the formulation of a proposed constitutional amendment providing for the fulfillment of the State Water Plan.

EFFECT OF PUBLIC WORKS

I recognize that there is an emergency value to public works construction. Construction is one of the few major industrial activities that creates a wage fund available to increase consuming power without, at the same time, creating more goods that must be bought. In other words, when a manufacturer doubles his operations, he pays out twice as much in wages, let us say, to increase consuming power; but he has made twice as much goods that must be bought. So we do not get ahead very fast. But when we spend money on construction, especially public works, we are creating a wage fund to increase consumption without, at the moment, producing more goods that must be bought and thereby outweigh the effect of the increased wage fund.—Willard T. Chevalier in *National Sand and Gravel Bulletin*.

"See here," the Indian inspector declared, "it is a violation of the law now to have more than one wife, and the law must be obeyed. When you get back home you tell all of your wives, except one, that they can no longer look upon you as their husband."

"You tell 'em," suggested the Indian after a moment's reflection.—*Public Construction News.*

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

LASSEN COUNTY—Horse Lake Dam No. 245. M. Jaurequi, Williams, owner; earth and rock, located in Sec. 4, T. 32 N., R. 14 E., M. D. B. and M.

SAN MATEO COUNTY—Cassinelli Dam No. 605. Angelo Cassinelli, San Francisco, owner; concrete buttress, 17 feet above streambed with a storage capacity of 30 acre-feet, situated on Arroyo Leon tributary to Pillaritos Creek in Sec. 33, T. 5 S., R. 5 W., M. D. B. and M. For storage purposes for irrigation use.

SAN MATEO COUNTY—Johnston Dam No. 605-2. E. J. Cassinelli, San Francisco, owner; gravity, 22 feet above streambed with a storage capacity of 68 acre-feet, situated on Arroyo Leon tributary to Pillaritos Creek in Sec. 32, T. 5 S., R. 5 W., M. D. B. and M. For storage purposes for irrigation use.

CALAVERAS COUNTY—Cherokee Dam No. 494. Cherokee Development Company, Angels Camp, owner; gravity, 13 feet above streambed with a storage capacity of 10.6 acre-feet, situated on Cherokee Creek tributary to Calaveras River in Sec. 9, T. 3 N., R. 12 E., M. D. B. and M., for storage purposes for mining use.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

MARIN COUNTY—Belvedere Dam No. 33-4. Marin Municipal Water District, San Rafael, owner; earth dam with a storage capacity of 23 acre-feet.

EL DORADO COUNTY—El Dorado Forebay Dam No. 97-53. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Long Canyon tributary to South Fork American River in Sec. 25, T. 11 N., R. 12 E., M. D. B. and M.

TOULUMNE COUNTY—Montezuma Dam No. 97-76. Pacific Gas and Electric Company, San Francisco, owner; earth, 9 feet above streambed with a storage capacity of 11½ acre-feet, in Sec. 30, T. 1 N., R. 14 E., M. D. B. and M. For regulation purposes for irrigation and mining use.

STANISLAUS COUNTY—Dallas-Warner No. 1 Dam No. 59. Modesto Irrigation District, Modesto, owner; earthfill, located in Sec. 20, T. 3 S., R. 12 E., M. D. B. and M.

ORANGE COUNTY—Basin "A" Dam No. 795. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "B" Dam No. 795-2. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "C" Dam No. 795-3. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "D" Dam No. 795-4. Union Oil Company, Los Angeles, owner; earth, located in Sec. 11, T. 3 S., R. 10 W., S. B. B. and M.

LOS ANGELES COUNTY—Mulholland Dam No. 6-17. City of Los Angeles, Los Angeles, owner, situated on Weid Canyon in Sec. 3, T. 1 S., R. 14 W., S. B. B. and M.

ORANGE COUNTY—Yorba Dam No. 791. Anaheim Union Water Company, Anaheim, owner; located in Sec. 27, T. 3 S., R. 9 W., S. B. B. and M.

ANADOR COUNTY—Henderson Dam No. 1-10. Preston School of Industry, Waterman, owner; earth, situated on Middle Fork of Mule Creek tributary to Sutter Creek in Sec. 9, T. 6 N., R. 10 E., M. D. B. and M.

LOS ANGELES COUNTY—Harold Reservoir No. 57-2. Palmdale Irrigation District, Palmdale, owner; earth, located in Sec. 3, T. 5 N., R. 12 W., S. B. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

CONTRA COSTA COUNTY—Antioch Dam No. 3. Town of Antioch, Antioch, owner; earth, 26.5 feet above streambed with a storage capacity of 570 acre-feet, situated on unnamed creek tributary to San Joaquin River in Sec. 36, T. 2 N., R. 1 E., M. D. B. and M. For storage purposes for municipal use.

ORANGE COUNTY—Irvine Conservation Dam No. 793-3. The Irvine Company, Tustin, owner; earth, 28½ feet above streambed with a storage capacity of 16,846 acre-feet, tributary to Newport Bay in Lot 442, Block 57, Irvine's Subdivision. For storage purposes, for irrigation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of March, 1932.

SISKIYOU COUNTY—Hart Dam No. 181. E. C. and Kate C. Hart, Montague, owner; earth, situated on Martin Creek tributary to Little Shasta River.

EL DORADO COUNTY—El Dorado Forebay Dam No. 97-53. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Long Canyon tributary to South Fork American River in Sec. 25, T. 11 N., R. 12 E., M. D. B. and M.

TOULUMNE COUNTY—Montezuma Dam No. 97-76. Pacific Gas and Electric Company, San Francisco, owner; earth, 9 feet above streambed with a storage capacity of 11½ acre-feet, located in Sec. 30, T. 1 N., R. 14 E., M. D. B. and M. For regulation purposes for irrigation and mining use.

STANISLAUS COUNTY—Dallas-Warner Dam No. 59. Modesto Irrigation District, Modesto, owner; earth, located in Sec. 20, T. 3 S., R. 12 E., M. D. B. and M.

ORANGE COUNTY—Basin "A" Dam No. 795. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., M. D. B. and M.

ORANGE COUNTY—Basin "B" Dam No. 795-2. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "C" Dam No. 795-3. Union Oil Company, Los Angeles, owner; earth, located in Sec. 10, T. 3 S., R. 10 W., S. B. B. and M.

ORANGE COUNTY—Basin "D" Dam No. 795-4. Union Oil Company, Los Angeles, owner; earth, located in Sec. 11, T. 3 S., R. 10 W., S. B. B. and M.

LOS ANGELES COUNTY—Mulholland Dam No. 6-17. City of Los Angeles, Los Angeles, owner; gravity, situated on Weid Canyon in Sec. 3, T. 1 S., R. 14 W., S. B. B. and M.

SAN DIEGO COUNTY—Smaller Lemon Grove Dam No. 56-8. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, located in Sec. 30, T. 16 S., R. 1 W., S. B. B. and M.

ORANGE COUNTY—Yorba Dam No. 791. Anaheim Union Water Company, Anaheim, owner; earth dam.

SAN DIEGO COUNTY—Larger Lemon Grove Dam No. 56-7. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, located in Sec. 25, T. 16 S., R. 2 W., S. B. B. and M.

SAN DIEGO COUNTY—Harold Dam No. 57-2. Palmdale Irrigation District, Palmdale, owner; earth, located in Sec. 3, T. 5 N., R. 12 W., S. B. B. and M.

More than 18½ feet of snow has fallen at Big Bear Lake in the San Bernardino mountains this winter. The precipitation has been 55.75 inches. The lake has risen seven feet six inches from its former level, it is reported, and is now at the 44-foot 11-inch mark on the dam.

March Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of March, 1932.

SISKIYOU COUNTY—Application 7197. Johan Stephanson, Sonies Bar, for 10 c.f.s. from Sandy Bar Creek tributary to Klamath River to be diverted in Sec. 21, T. 13 N., R. 6 E., H. B. and M., for mining purposes.

DEL NORTE COUNTY—Application 7198. Harry T. Wilkerson, 1824 Thousand Oaks Blvd., Berkeley, for 50 c.f.s. from Hurdy Gurdy Creek tributary to South Fork of Smith River to be diverted in Sec. 20, T. 16 N., R. 3 E., H. B. and M., for mining purposes.

SAN MATEO COUNTY—Application 7199. W. R. Bartley and M. S. Woodhams, c/o Maurice S. Woodhams, Atty., La Honda, for 166 acre-feet per annum from Alpine Creek tributary to San Gregorio Creek to be diverted in Secs. 23 and 26, T. 7 S., R. 4 W., M. D. B. and M., for recreational and domestic purposes.

SAN MATEO COUNTY—Application 7200. W. R. Bartley and M. S. Woodhams, c/o Maurice S. Woodhams, Atty., La Honda, for 0.02 c.f.s. from La Honda Creek tributary to San Gregorio Creek to be diverted in Sec. 23, T. 7 S., R. 4 W., M. D. B. and M., for recreational and domestic purposes.

EL DORADO COUNTY—Application 7201. B. W. Stone, 161 Ellis Street, San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River (2) Pilot Creek (3) Gerle Creek (4) Loon Lake (5) Buck Island Lake (6) Rock Bound Lake (7) Little South Fork Rubicon River tributary to American River drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E., Sec. 11, T. 12 N., R. 12 E., Sec. 24, T. 13 N., R. 13 E., Secs. 1, 31 and 34, T. 14 N., R. 14 E., Sec. 4, T. 13 N., R. 15 E., Sec. 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

SAN BERNARDINO COUNTY—Application 7202. W. T. Elliot, Summit, for 0.025 c.f.s. (1 miners inch) from unnamed stream tributary to Canada Stream (Little Horse Thief Canyon) thence Mojave River to be diverted in Sec. 33, T. 3 N., R. 5 W., S. B. B. and M., for irrigation and domestic purposes (1 acre). Estimated cost \$5.

PLUMAS COUNTY—Application 7203. Johnson and Openshaw, Oroville, for 3.0 c.f.s. from Indian Creek tributary to middle branch Feather River, Feather River, thence Sacramento River to be diverted in Sec. 19, T. 26 N., R. 10 E., M. D. B. and M., for irrigation purposes. (240 acres.) Estimated cost \$7,500.

TULARE COUNTY—Application 7204. Regents of the University of California, c/o Calkins, Hagar, Hall and Linforth, Atty., Crocker Bldg., San Francisco, for total of 65,000 gallons per day tributary of East Fork Eshom Creek tributary to Camp Creek and West Fork Eshom Creek tributary to Keweah River to be diverted in Secs. 15 and 16, T. 14 S., R. 28 E., M. D. B. and M., for recreational and domestic purposes. Estimated cost \$300.

HUMBOLDT COUNTY—Application 7205. Verne Gephart, Bluff Creek, via Welchke, for 2 c.f.s. from French Bar Gulch tributary to Klamath River to be diverted in Sec. 21, T. 10 N., R. 5 E., H. B. and M., for mining purposes. Estimated cost \$200.

RIVERSIDE COUNTY—Application 7206. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, Consulting Engineer, 925 Central Bldg., Los Angeles, for 1 c.f.s. and 730 acre-feet per annum from Virgin Spring tributary to unnamed creek thence Horse Thief Creek to be diverted in Sec. 26, T. 7 S., R. 5 E., S. B. B. and M., for recreational and domestic purposes.

RIVERSIDE COUNTY—Application 7207. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, Consulting Engineer, 925 Central Bldg., Los Angeles, for 5 c.f.s. and 2,000 acre-feet per annum from Omstott Creek tributary to Palm Canyon to be diverted in Sec. 10, T. 7 S., R. 5 E., S. B. B. and M., for recreational and domestic purposes.

RIVERSIDE COUNTY—Application 7208. Palm Springs Land and Irrigation Company, c/o A. L. Son-

deregger, Consulting Engineer, 925 Central Bldg., Los Angeles, for 1 c.f.s. and 730 acre-feet per annum from Cactus Spring tributary to Horse Thief Creek to be diverted in Sec. 18, T. 7 S., R. 6 E., S. B. B. and M., for domestic and recreational purposes.

RIVERSIDE COUNTY—Application 7209. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, 925 Central Bldg., Los Angeles, for 10 c.f.s. and 5,000 acre-feet per annum from Deep Canyon Creek tributary to Whitewater River to be diverted in Sec. 12, T. 7 S., R. 5 E., S. B. B. and M., for irrigation purposes.

RIVERSIDE COUNTY—Application 7210. Palm Springs Land and Irrigation Company, c/o A. L. Sonderegger, 925 Central Bldg., Los Angeles, for 10 c.f.s. and 5,000 acre-feet per annum from Deep Canyon Creek tributary to Whitewater River to be diverted in Sec. 12, T. 7 S., R. 5 E., S. B. B. and M., for recreational and domestic purposes.

HUMBOLDT COUNTY—Application 7211. Fred Bair, Standard Bldg., Eureka, for 0.25 c.f.s. from Bair Creek tributary to Klamath River to be diverted in Sec. 36, T. 10 N., R. 4 E., H. B. and M., for irrigation and domestic purposes. (5 acres.) Estimated cost \$500.

TEHAMA COUNTY—Application 7212. Stanley B. Mathews and Warren P. Clark, c/o Stanley B. Mathews General Delivery, Chico, for 0.02 c.f.s. from Digger Creek tributary to Thoms Creek, thence Sacramento River to be diverted in Sec. 26, T. 24 N., R. 7 W., M. D. B. and M., for industrial purposes. Estimated cost \$100.

TEHAMA COUNTY—Application 7213. Stanley B. Mathews and Warren P. Clark, c/o Stanley B. Mathews, General Delivery, Chico, for 0.15 c.f.s. from Digger Creek tributary to Thoms Creek, thence Sacramento River to be diverted in Sec. 26, T. 24 N., R. 7 W., M. D. B. and M., for mining and domestic purposes. Estimated cost \$200.

LOS ANGELES COUNTY—Application 7214. United States, Angeles National Forest, c/o William V. Mendenhall, Supervisor, 501 Brownstein Louis Bldg., Los Angeles, for 0.003 c.f.s. from unnamed spring tributary to Piru Watershed to be diverted in Sec. 12, T. 6 N., R. 18 W., S. B. B. and M., for fire protection purposes. Estimated cost \$500.

LOS ANGELES COUNTY—Application 7215. United States, Angeles National Forest, c/o William V. Mendenhall, Supervisor, 501 Brownstein Louis Bldg., Los Angeles, for 1 c.f.s. from Big Tujunga Ranger Station Spring tributary to Big Tujunga River, thence Los Angeles River to be diverted in Sec. 31, T. 3 N., R. 13 W., S. B. B. and M., for irrigation and domestic purposes. (1 acre.) Estimated cost \$150.

SIERRA COUNTY—Application 7216. Chas. J. Scanlan, Jr., Camptonville, for (1) 2 c.f.s. (2) 1 c.f.s. total 3 c.f.s. from (1) South Fork of North Fork of Indian Creek (2) North Fork of Indian Creek tributary to Indian Creek, thence North Fork Yuba River and Yuba River to be diverted in Sec. 21, T. 19 N., R. 9 E., M. D. B. and M., for mining and domestic purposes.

NEVADA COUNTY—Application 7217. Harry Ramsden, 1258 35th Avenue, San Francisco, for 10 acre-feet per annum from natural reservoir to be diverted in Sec. 7, T. 17 N., R. 8 E., M. D. B. and M., for irrigation and domestic purposes.

ALAMEDA COUNTY—Application 7218. Lida A. Morris, P. O. Box 265, Ogden, Utah, for 0.55 c.f.s. from Arroyo De La Laguna tributary to San Francisco Bay to be diverted in Sec. 3, T. 5 S., R. 1 W., M. D. B. and M., for irrigation purposes. (35.15 acres.) Estimated cost \$400.

MONO COUNTY—Application 7219. Inyo National Forest, Bishop, for 0.006 c.f.s. from unnamed stream tributary to Mammoth Creek and Owens River to be diverted in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M., for domestic purposes.

LASSEN COUNTY—Application 7220. C. A. Molster, 1407 1/2 W. 11th Place, Los Angeles, for 3 c.f.s. from Smoke Creek tributary to Mud Flat to be diverted in Sec. 13, T. 32 N., R. 17 E., M. D. B. and M., for irrigation purposes. (164 acres.) Estimated cost \$125.

Permits Issued to Appropriate Water in Various Counties

(Continued from preceding page)

DEL NORTE COUNTY—Application 7221. Carl Bruno, Klamath, for 0.15 c.f.s. from 2 unnamed streams tributary to small stream flowing into Pacific Ocean to be diverted in Sec. 20, T. 14 N., R. 1 E., H. B. and M., for power purposes. (1.5 h.p.) Estimated cost \$2,500.

DEL NORTE COUNTY—Application 7222. Carl Bruno, Klamath, for 0.125 c.f.s. from 3 unnamed streams tributary to a small stream flowing into Pacific Ocean to be diverted in Sec. 20, T. 14 N., R. 1 E., H. B. and M., for recreational and domestic purposes. Estimated cost \$2,000.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of March, 1932.

YUBA COUNTY—Permit 3863, Application 7130. Andrew J. Thickstun, Clipper Mills, March 7, 1932, for 50.00 c.f.s. from Slate Creek tributary to North Fork Yuba River in Sec. 10, T. 19 N., R. 8 E., M. D. B. and M., for mining. Estimated cost \$5,000.

SAN DIEGO COUNTY—Permit 3864, Application 7126. John Allen and Almira B. Crawford, Potrero, March 12, 1932, for 0.06 c.f.s. from Campo Creek in Sec. 24, T. 18 S., R. 4 E., S. B. B. and M., for recreational and domestic purposes. Estimated cost \$1,000.

EL DORADO COUNTY—Permit 3865, Application 7019. E. R. Hickey, G. L. Davenport and L. J. Caldwell, Kyburz, El Dorado County, March 15, 1932, for 600 gallons per day from unnamed stream tributary to South Fork American River in Sec. 19, T. 11 N., R. 16 E., M. D. B. and M., for domestic purposes. Estimated cost \$75.

PLUMAS COUNTY—Permit 3866, Application 7003. J. B. Higgins, Quincy, March 17, 1932, for 8.00 c.f.s. from Blackhawk Creek tributary to Spanish Creek and Feather River in Sec. 27, T. 25 N., R. 9 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$1,000.

SANTA BARBARA COUNTY—Permit 3867, Application 7185. Mrs. Stanley McCormick et al., Santa Barbara, March 21, 1932, for 1.06 c.f.s. and 35 acre-feet per annum from Cold Spring Creek tributary to Pacific Ocean in Sec. 7, T. 4 N., R. 26 W., S. B. B. and M., for domestic purposes and irrigation of 85 acres. Estimated cost, \$1,500.

SANTA BARBARA COUNTY—Permit 3868, Application 7159. Mrs. Stanley McCormick et al., Santa Barbara, March 21, 1932, for 0.80 c.f.s. and 3.0 acre-feet per annum from Hot Spring Creek tributary to Pacific Ocean in Sec. 7, T. 4 N., R. 26 W., S. B. B. and M., for domestic purposes and irrigation of 85 acres. Estimated cost \$100.

INYO COUNTY—Permit 3869, Application 7115. Standard Oil Company of California, 225 Bush Street, San Francisco, March 22, 1932, for 40,000 gallons per day from Last Chance Springs in Sec. 2, T. 8 S., R. 39 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$500.

SAN DIEGO COUNTY—Permit 3870, Application 6864. Coleman M. Gray, Pala, San Diego County, March 22, 1932, for 0.0225 c.f.s. from Castro Creek tributary to San Luis Rey River in Sec. 18, T. 9 S., R. 7 W., S. B. B. and M., for irrigation of 6 acres. Estimated cost \$1,870.

SISKIYOU COUNTY—Permit 3871, Application 7084. Marshall M. Crawford, Happy Camp, March 28, 1932, for 3.00 c.f.s. from China Creek tributary to Klamath River in Sec. 9, T. 16 N., R. 8 E., H. B. and M., for domestic and irrigation of 140 acres in said Sec. 9. Estimated cost \$1,500.

MODOC COUNTY—Permit 3872, Application 6290. Estate of J. L. Porter, by Mrs. Pearl F. Porter, Administratrix, Box 121, Alturas, March 29, 1932, for 180 acre-feet per annum from Parker Creek tributary to Pit River in Sec. 18, T. 42 N., R. 13 E., M. D. B. and M., for irrigation of 108 acres. Estimated cost \$2,000.

MODOC COUNTY—Permit 3873, Application 6291. James C. Porter and Mrs. P. E. Porter, Alturas, March 29, 1932, for 6.00 c.f.s. and 292.5 acre-feet per annum from Parker Creek tributary to Pit River in Sec. 18, T. 42 N., R. 14 E., M. D. B. and M., for irrigation of 172 acres. Estimated cost \$3,000.

Bay Bridge Plans Provide Space for 2 Railroad Tracks

(Continued from page 23)

cities and San Francisco without cost to abutting property or to the cities."

The San Francisco-Oakland Bay Bridge engineering staff are now conducting approach studies to determine locations, in cooperation with the Board of Engineers appointed by the city authorities. Final locations, however, can not be determined until completion of the East Bay transportation study, which will undoubtedly result in a close working agreement or consolidation of the Key Route and the Southern Pacific.

Plans for the Bay Bridge now call for but two operating tracks for interurban cars. Two tracks will care for double the present commuter traffic. Investigation shows that it would be economically unsound to provide for additional facilities.

MEANS \$800,000 SAVING

With provision being made for but two tracks, a merger or a close operating agreement between the Key System and the Southern Pacific Company will become necessary. The California Railroad Commission has advocated a merger of the two East Bay interurban systems since 1927.

It is agreed that this consolidation will result in operating economy without any detriment to the present service. Estimates of the saving due to the elimination of duplication run as high as \$800,000 per year. The engineers of the Bay Bridge have had several conferences with the officials of the two companies to the end that an agreement as to operating details and the rearrangement of tracks may be decided along with the plans for the east approach to the bridge.

Chief Engineer Purcell is hopeful that these negotiations may lead to a speedy agreement. The railroads have indicated their cooperation through the retention of H. G. Butler, consulting engineer of San Francisco, who is collaborating with the engineers of the bridge in a study of the best track arrangements and of all engineering problems. These investigations are now under way.

HOW TO FLY HIGH

Mrs. Rideout—What lovely, fleecy clouds. I'd like to be up there sitting on one of them.

Mr. Rideout—All right—you drive the car.

They laughed when I started to make a new kind of dynamite, but when I dropped it, they exploded.—*Cornell Widow.*

Coast Traffic Compels Wider Span

By C. W. JONES, Engineer, Bridge Department

IN CONNECTION with the work of widening the Coast Highway between Los Angeles and San Diego to meet increased traffic needs, the Division of Highways recently remodeled the bridge over the Santa



PONY TRUSS spans of steel carried coast traffic over the old inadequate 24-foot bridge across the Santa Ana River in Orange County.

Ana River which was built by Orange County some eight years ago.

The old structure was 24 feet wide. It was composed of a number of steel pony truss spans, together with concrete approach spans, a total length of 420 feet.

As far as possible, the Division of Highways has tried to avoid the use of types of bridge structures having supporting trusses which extend above the roadway pavement, for when bridges are widened, it is undesirable to have central obstructions which vehicles may strike. Although the old Santa

Ana River bridge had such trusses, investigation showed that clear deck type of construction could be built economically without reducing flow capacity. It also showed that Orange County, which gave the structure to the State, had need for the old trusses and would be glad to have them turned back to the county for use on a county road.

Decision was therefore reached to give the old trusses to the county and widen the bridge, providing a roadway width of 46 feet, including sidewalk, entirely free from central obstruction. An asphaltic wearing surface was



MODERNIZED by a widening operation and new concrete railings, the recently remodeled structure now provides a 46-foot roadway with sidewalk.

placed across the entire new deck to level off the surface and produce not only good appearance but good riding quality.

Construction work was done for a contract price of approximately \$60,000.

Watch All Traffic at Highway Crossings

Be careful in driving across intersections. The law requires motorists to be watchful of all other traffic under such circumstances. The Appellate Court in a recent decision held that the driver of an automobile proceeding across an intersection is negligent unless he observes traffic coming from either direction on the intersecting street, even though he is driving slowly. The court said it is not enough to look in one direction until reaching the center of the intersection and then look in the other direction.

March Auto Output in U. S. Shows Gain

Estimates of motor vehicle production in the United States in March indicate an output of 130,700 cars and trucks, according to a report received from the Automobile Chamber of Commerce.

This estimate was based on incomplete reports from manufacturers and points to an increase of 6 per cent in March production over that of the preceding month.

Peters—Is your wife a good driver?
Jeters—Well, I'm not sure whether she is or whether all the drivers she meets are.

Highway Commission Hears Delegates on Road Problems

(Continued from page 26)

uniformed military units and bands from March Field, 185th Infantry, California National Guard, R. O. T. C., and a detachment from the Sherman Institute Indian School.

AT SAN LUIS OBISPO

The regular meeting of the Commission held at San Luis Obispo on April 15th in the Division of Highway headquarters building proved another very busy session with a crowded calendar and a room filled to capacity with delegations and spectators numbering several hundred in attendance throughout the entire day.

Eight delegations and speakers were formally heard and additional matters were informally presented by others present.

A joint delegation of Kings County and San Luis Obispo County representatives introduced by Assemblyman Chris Jespersen urged inclusion in the secondary highway system of the road from Fresno to Morro Bay via Stratford, Kettleman Hills, Cottonwood Pass and Atascadero. Chairman S. E. Railsback and Supervisors H. M. Nelson, J. H. McGlashan, T. E. Cochran and County Engineer Roy May appeared for Kings County. Chairman H. Twisselman with Supervisors E. W. Black, John Norton, John Marquart and Asa Porter represented San Luis Obispo County.

SIERRA-TO-THE-SEA ROUTE

The claims of the Sierra-to-the-Sea Highway for allocation of funds towards construction of the route west of Coalinga were discussed by Supervisors George Dudley, W. E. Goodspeed and D. B. Talbott of Monterey County, George S. Gould of Salinas and H. R. Sumph of Coalinga.

Delegations from Santa Barbara County included Supervisors C. L. Preisker and Roland M. Adam; County Planning Commissioner L. Deming Tilton, C. Kelley Hardenbrook, A. G. Bodine, H. R. Graham and Ralph Coane. Request was made for the inclusion in the secondary highway system of a road from Las Cruces to Lompoc, to Guadalupe, to Pismo to relieve trucking and tourist traffic on the Coast Route.

Mr. Tilton submitted a parkway plan for improvement of traffic conditions through Montecito and Mr. Bodine entered a protest against any proposal to close the present State highway through Buellton by the construction of the San Marcos Pass Road.

President Graham of the Santa Barbara City Council asked cooperation by the State in a plan for routing through traffic within the city limits.

SURVEY REQUESTED

Mr. Coane, representing the Santa Barbara Chamber of Commerce, requested a survey of the San Marcos Pass Road for final location and allocation of funds for the coming biennium.

B. J. Ahern, secretary of the San Juan Bautista Chamber of Commerce, and Reverend Father Caffrey of Mission San Juan Bautista asked consideration for a connecting road between San Juan Bautista and the Prunedale cut-off.

A delegation from Monterey County included Supervisors Robert Stirling and A. A. Caruthers; E. H. Tickle, C. M. Brown, Peter Mawdsley, Robert Parrott,

Paving Last Link of Redwood Highway in Del Norte County

(Continued from page 21)

Los Angeles-Sacramento arterial will begin when the advertisement is published for the construction of bituminous treated crushed rock borders on each side of the existing pavement over the 12 miles just south of Sacramento. These borders will be 2 feet wide, providing a surfaced road 24 feet wide with 6-foot shoulders, as a decided improvement to the present 20-foot pavement. The borders will extend from 2 miles north of McConnell Station to the one-half mile southeasterly of the Sacramento city limits.

Last season grading of a roadbed was completed on that section of the scenic Redwood Highway immediately north of Crescent City in Del Norte County. It is now proposed to place a bituminous treated crushed rock surface 20 feet wide over the new roadbed.

The limits of this project include the last of the unconstructed portions of this popular route along the north coast country between San Francisco and the Oregon line. The new road is an improvement to line, grade and width and its surfacing will bring this section to modern standards of highway construction.

The increasing popularity of this route between San Francisco and Oregon is evidenced by the increase in travel over the portion north of Crescent City in the last few years, traffic having tripled since 1926 on this section.

Wife (from depths of fashion journal)—Dear, do you know what the well dressed woman will have on this season when she goes out driving?

Hubby—Yes, the hand brake.

"Jones always strikes me as an indolent sort of chap."

"Indolent? Why that fellow is so lazy he always runs his automobile over a bump to knock the ashes off his cigar."

A. W. Files, G. S. Gould, M. J. Murphy, D. N. Staniford, Charles McGrath, J. H. Thompson, and W. J. Crabbe. They asked for the inclusion of a road from Castroville to a connection with the Prunedale cut-off in the secondary system.

Mr. Tickle urged that sufficient funds be allocated during the coming biennium for completion of the Carmel-San Simeon Highway.

The Commission and staff, during their visit were entertained by the supervisors of San Luis Obispo County at a barbecue given by the brookside in Estrada Gardens.

STATE OF CALIFORNIA

Department of Public Works

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JAMES I. HERZ-----Deputy Director

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L. V. CAMPBELL, Office Engineer

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FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding

CHARLES H. WHITMORE, District III, Sacramento

J. H. SKEGGS, District IV, San Francisco

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FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample

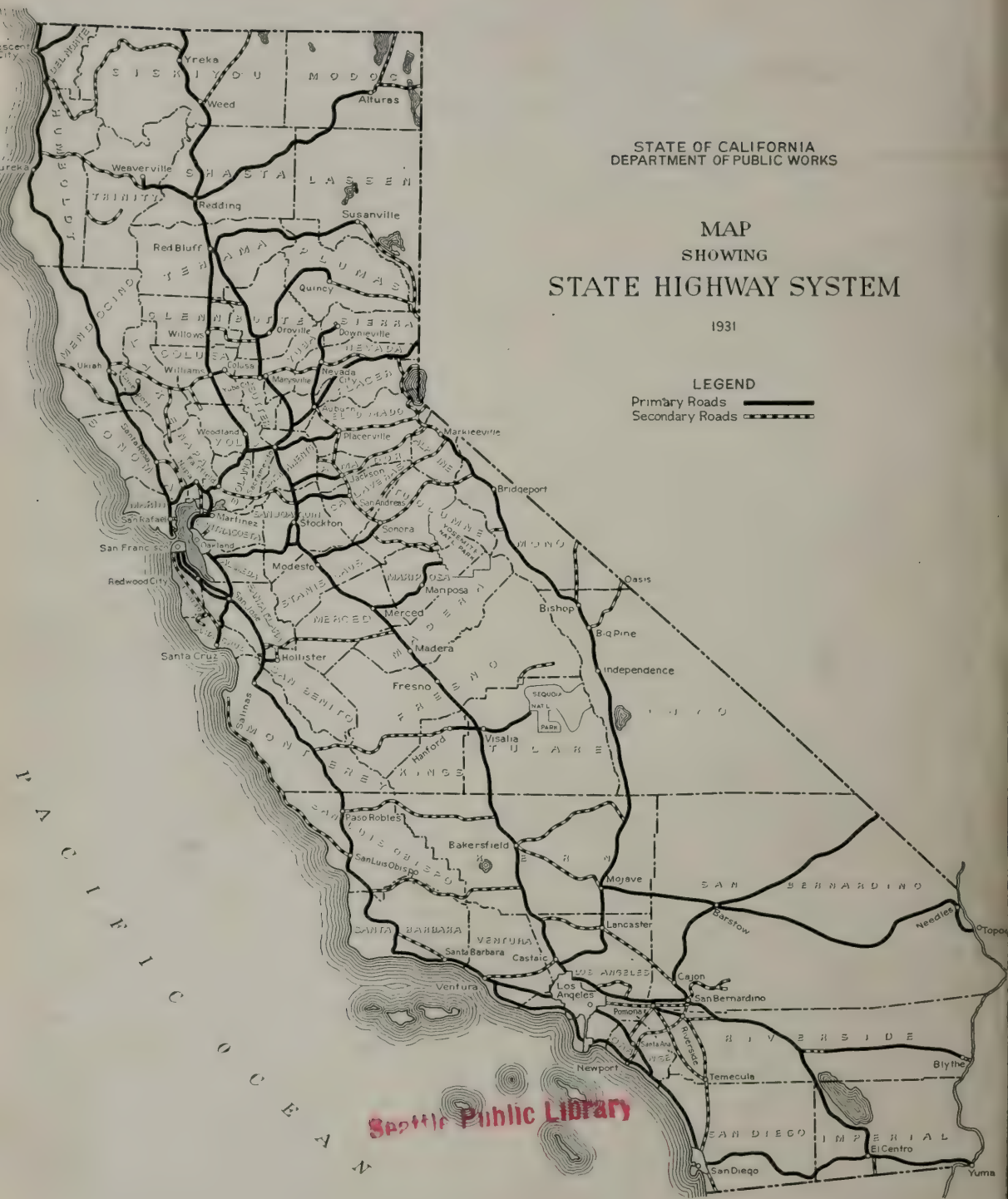
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND

Primary Roads —————
Secondary Roads - - - - -



CALIFORNIA HIGHWAYS and PUBLIC WORKS



State Highways Pay Daily Dividends
in Service and Transportation
savings on the peoples' investment.

MAY 1932

Official Journal of
THE DEPARTMENT of PUBLIC WORKS
State of California

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\$54,000,000 *Earned By Our Highways*

Joint Traffic Survey by State and Federal Departments Reveals Transportation Savings Returned on People's Capital Investment

This is the first of two articles dealing with the economic value of California's State highway system as represented by the returns on the capital investment in transportation service and savings to the people of the Commonwealth. These articles are based on an exhaustive cooperative survey made by the Federal Bureau of Public Roads and the State Department of Public Works. The second article will appear in the next issue.

By **T. H. DENNIS**, Maintenance Engineer

BASED on a saving of one and one-quarter cents per mile in reduced fuel and motor vehicle operating costs, California's State highways, up to June 30, 1930, have, after deducting all maintenance, interest and depreciation charges, earned \$54,000,000 on their capital investment. During the same period the safeguarding of this investment through maintenance has cost the motor vehicle operator but one-fourth of the earnings effected in each mile operated.

The above statements are based on the utilization of the State highway system as determined from the joint traffic survey of the Bureau of Public Roads of the United States Department of Agriculture and the State Division of Highways, conducted during the period September, 1929, to October, 1930.

The operating differentials used are those developed in 1926 by the Iowa State College Experimental Station to establish the economic relation between surface type and requisite tractive effort. Differentials in gasoline consumption and tire wear were determined on surfaces ranging from gravel to concrete.

COST VARIATIONS

It was found that the costs varied not only with the type of road surface, but with the weight of the vehicle, being higher as the weight increased. For a vehicle weighing 3000 pounds the operating cost per mile

varied as shown on the following surface types:

Concrete	\$0.0175
Bitulithic	0.0212
Macadam	0.0412
Gravel	0.045

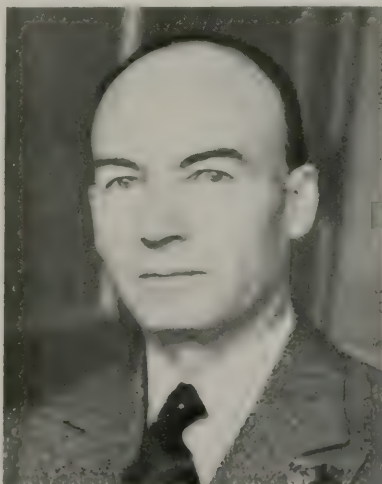
The estimated average saving per vehicle mile in operating on the State highway system as improved in 1930, over what it would have cost to operate on the same mileage of unimproved earth or rock surfaced road, is arrived at by applying the cost per mile, as given above to the mileage by kind of surface in the highway system.

The average cost of operation per vehicle mile over the improved portion of the system, works out as \$0.0198 per vehicle mile for the combined high and intermediate types of surface and 0.0284 per vehicle mile for the entire system.

The comparisons for operation over the entire system as well as over the com-

bined high and intermediate types only, are as follows:

	Per vehicle mile
Average cost of operation over an unimproved highway system.....	\$0.045
Average cost of operation over present highway system.....	0.0284
Estimated saving.....	\$0.0166
Average cost of operation over an unimproved highway system.....	\$0.045
Average cost of operation over the improved portion of the highway system.....	0.0198
Estimated saving.....	\$0.0252



T. H. DENNIS

Highway Division Plays Large Part in Welcoming Akron to Sunnyvale

THE U. S. NAVY Dirigible Akron, arriving at Sunnyvale Air Base on her maiden voyage to the coast found that the State Department of Public Works through its Division of Highways had taken a leading part in arranging a rousing welcome for her by eager thousands of patriotic Californians.

A newly completed link of the Bayshore Highway running past the southerly side of the air base gave a vast multitude of motorists and pedestrians opportunity for a spectacular view of the great naval airship slowly descending to her anchorage and a close-up of her tremendous bulk as she floated at her mooring mast close to the highway.

This short stretch of modern standard highway, rushed to completion under the supervision of Col. Jno. H. Skeggs, District Engineer, is a link of the Bayshore Highway being built by the State between San Francisco and San Jose. It was designed to accommodate the sightseeing crowds that will visit the great Akron at anchor in her home port. It is 1.2 miles long providing a 60-foot roadway on a 150-foot right of way, ample to eventually provide a 100-foot roadway with parking area along each side. It has been given a temporary light fuel oil surface for immediate traffic needs.

MAJOR TRAFFIC PROBLEM

The naval officials at Sunnyvale were considerably concerned about the handling of traffic after the dirigible had been anchored at her mooring mast, having had considerable experience with this problem in the East where, they stated, the traffic congestion at the Lakehurst hangar, when the Graf Zeppelin was moored there, had taken three days to untangle.

However, the State Division of Highways had anticipated such a problem and the California Highway Patrol worked out a traffic plan that would permit all machines to pass the air base and view the Akron without serious congestion. The heavy flow of traffic began Friday, May 13th, and continued through Saturday, Sunday and Monday. At times, after dusk, there were seven lines of traffic abreast flowing past the air base.

2337 CARS IN HOUR

On Sunday, the Division of Highways took a traffic count which revealed 22,282 automobiles passing the air base in one direction in a 16-hour period, with a peak traffic of 2337 cars in one hour's time.

The very slow movement of vehicles prevented a great number of additional cars from entering the Bayshore highway. These cars were parked along various county roads and private property given over to parking, while their occupants joined thousands of pedestrians standing along the south side of the Bayshore Highway, that being the dead line for pedestrian traffic.

The full benefits of these traffic achievements were apparent at the interesting dedicatory exercises held Saturday afternoon, May 14th, before a temporary speakers' stand erected near the Akron and attended by a vast throng of spectators.

Admiral Cole, Commander of the 12th Naval District told how the Naval Base was established and the great possibilities of a lighter-than-air dirigible which could be placed in civilian passenger traffic as well as naval activities.

AMAZING POSSIBILITIES

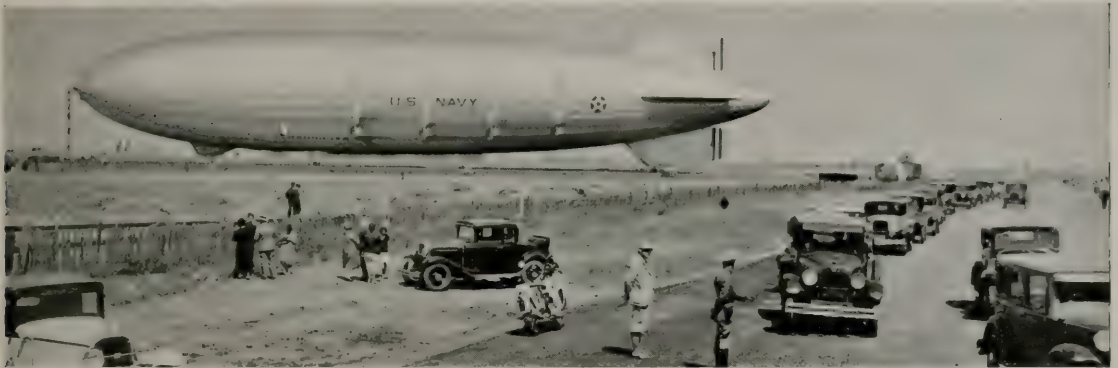
He described how easily the great ship Akron could leave New York and, as she approached Cleveland or Chicago, a small airplane could take on its load of passengers, rise, and contact the Akron at full flight, unload its passengers and then drop from the Akron and return to its local base. The Admiral's description of this particular phase elicited a great cheer from the thousands present.

Lieut. Commander Charles E. Rosendahl, Commander of the Akron, briefly described the entire trip from the Atlantic to the Pacific coast, with all the phases of the flight through storms, to San Diego, and its trip up the California coast to Sunnyvale. He, too, expressed the great possibilities of dirigibles for long commercial flights, especially over seas. Hon. Louis Oneal of San Jose, representing Governor Rolph, briefly described the work of the various chambers of commerce of the San Francisco Bay region

(Continued on page 29)



OUT OF THE MISTS of the morning the great U. S. Navy Dirigible Akron appeared above the newly completed link of the Bayshore Highway that passes the Air Base at Sunnyvale affording a vantage point for thousands of motorists and pedestrians who gathered in the early dawn to greet her.



THE PASSING PARADE that numbered 22,282 automobiles in sixteen hours obtained a spectacular view of the new leviathan of the skies as she lay at her anchorage close to earth just off the wide new highway built to give easy access for thousands of citizens who will visit the ship.



A CLOSE-UP picture of the monster dirigible reveals how her huge bulk, 785 feet in length, extends from the mooring mast almost to the new highway where her rudders and elevator fins loom high above the stream of cars. One-way traffic is the rule and the spacious highway permitted autos to roll seven abreast Sunday evening.

Building Longest Concrete Arch in State Where Bixby Creek Joins Sea

By **H. D. STOVER**, Designing Engineer, Bridge Department

EXHAUSTIVE engineering studies of the Bixby Creek Crossing on Route 56, better known as the Carmel-San Simeon Highway, having been made, plans proposed for the project resolved into a choice of two possible lines of apparent equal cost. One line employed a tunnel eight hundred ninety feet (890 ft.) long, and a bridge some two hundred fifty feet (250 ft.) in length crossing Bixby Creek some distance upstream from the creek mouth. The other line employed a high bridge spanning between the bluffs at the creek mouth.

The latter line was chosen for several reasons—the principal ones being that it made a safer road for the traveling public as well as affording a more scenic route. Thus we have our subject—"The Bixby Creek Arch."

Three thousand years ago and more, before man's intellect conceived the tools with which to construct the complex structures of today, ancient architects and builders made use of the arch as an adjunct in their building. History indicates that, while ancient use of the arch was restricted to architectural embellishment rather than as a structural unit, we may well say the arch is as old as civilization.

RECORD SIZE ARCH

Today the Division of Highways has under contract the construction of the longest reinforced concrete fixed arch ever undertaken within the State. The structure, to be specific, is located across Bixby Creek approximately eighteen miles south of Carmel.

The exigencies of modern highway construction and the superb grandeur of nature have united at the mouth of Bixby Creek to present a spectacular perspective that will be unexcelled on the Monterey Coast. The curved approaches will tend to display the arch to great advantage in this scenic setting.

The elements of the bridge are one 330-foot open spandrel deck arch span and 9

40-foot deck girder approach spans providing a 24-foot clear roadway at approximately two hundred sixty feet above stream bed.

Other notable reinforced concrete arch spans constructed by the Division of Highways are the Feather River Crossing east of Oroville, consisting of one 270-foot arch span and 4 80-foot arch spans; also the Harlan D. Miller Memorial Bridge in Shasta County, consisting of one 250-foot arch span and 8 24-foot girder spans.

DIFFICULT JOB

Construction of an arch rib of this great span and high rise is at once a difficult and hazardous construction problem. Conventional practice requires the use of an elaborate timber falsework to support the arch rib forms during the pouring of concrete. In order to take advantage of any possible financial benefit which might accrue through the elimination of falsework construction, the design provided alternative construction methods.

The first alternative provided for arch rib construction in the conventional or usual manner of timber falsework. The second alternative was unique in that the use of falsework was eliminated by the expedient of structural steel arch ribs which would support the form and at the same time provide necessary reinforcing when encased

in concrete.

Contractors were required to submit bids on both alternatives, with the State agreeing to accept the lowest bid regardless of which alternative was lowest. The contract was awarded to an engineering company of Oakland, that submitted a low bid of \$203,334 for the alternative requiring falsework for arch rib construction.

I. O. Jahlstrom is Resident Engineer on this project, representing the State.



H. D. STOVER

Rearing goldfish for the market has developed into a \$1,000,000 industry, according to the Bureau of Fisheries of the Department of Commerce.



HIGH WIDE AND HANDSOME will be the 330-foot span made by the open spandrel deck concrete arch of the bridge across Bixby Creek on the Carmel-San Simeon coast highway. The above views show the record-breaking arch under construction.

Carson Relocation Takes 184 Curves Out of All-Year Route to Yosemite

By E. E. WALLACE, District Engineer

AN IMPROVEMENT that will be much appreciated by motorists using the All-Year Highway into Yosemite is secured by the realignment of Route 18, in Mariposa County, from Orange Hill School to Mariposa, known as the Carson relocation.

The new line lies in general about four miles north of the old and traverses a portion of the Mariposa Grant, including the south portion of the Mother Lode, rich in historical lore of the Gold Discovery and the strenuous years immediately following.

The Mariposa Grant, about seventy square miles of cattle range, was purchased by Fremont in 1848 from Juan Alvarado, a one time revolutionary governor of California under Mexican rule. Fremont had commissioned an agent to purchase one of the rich mission farms and was not pleased that his \$3,000 was invested in grazing land of more or less indefinite value and boundaries, with title somewhat clouded.

GOLD BROUGHT STRIFE

When gold was discovered on the property, several years later, the elastic boundaries of the Grant and the fact that mineral rights were not conveyed in the title, plunged the vicinity into strife, which lasted many years.

The new highway route crosses the old townsite of Carson, where the ruins of several stone buildings, built during the "49 days," remain as evidence of early mining settlements. Mounds of gravel, turned over several times at different periods in the quest for precious metal, lie on every side.

Agua Fria and Carson creeks show evidence of diversion from their original banks and even today visitors will find prospectors and pleasure seekers panning for the few shining grains that remain in the gravel and sand of the creeks.

Near the new highway location is the townsite of Agua Fria, the first county seat of Mariposa County, which then included most of the San Joaquin Valley south of the Tuolumne. In 1854, the courthouse was moved to Mariposa, where the original building still is in use. Existing roads to the north penetrate the Mother Lode country. The town of Mount Bullion, near the famous Princeton Mine, is still inhabited. Further to the north is Ophir, site of the first mint in California and Bear Valley, which was the residence of the Fremonts on their grant.

SHORTENS DISTANCE

As a portion of the All-Year Route to Yosemite, the new highway location will shorten the travel time to this popular National Park. The appeal of the famous valley grows with the years and the added accessibility provided by improved roads. Yosemite Valley was first made known to the world in 1851 when the Mariposa Battalion under the direction of the United States Indian Commissioners traced a resistant Indian tribe to their mountain stronghold. Although the Indians considered themselves secure and were loath to leave their beautiful home (after somewhat unsatisfactory contact with the miners), the tribe was finally subdued by further expeditions of soldiers.

The first "tourist" visit to the Valley was in 1855, when the yearly total was about thirty visitors and this gradually increased to 147 in 1864 when the region was set apart by Congress "for public use, resort and recreation," under the State of California.

PIONEER ROADS

The first attempt at road building with the Yosemite as the objective was in 1856 when a toll trail suitable for horses was constructed. Other trails were built about the same time, but were not financially successful and there-



E. E. WALLACE



DEADMAN'S CURVE is a dangerous point with a blind approach on the present All-Year Yosemite Highway that has taken its toll of traffic accidents. It is one of the reasons for the new Carson relocation.



HISTORIC RUINS along the new route include this old store near Agua Fria, largest in the county during the Gold Rush.



BANDIT DAYS are recalled by the pioneer store at Mount Bullion, its doors and windows protected by heavy steel.



BEAUTIFUL BUT TOUGH for the highway builder are the many deep gulches that add scenic interest and numerous hairpin turns to this existing link on the All-Year route. They are avoided in the new location nearer the stream sources.

"Men and Equipment Working" Signs Mean Protection to Crews

ONE of the problems in connection with highway maintenance work is the protection of men and equipment as well as the traveling public when it is necessary to make repairs and carry on working operations from the traveled way.

From the workman's point of view many motorists have a reckless disregard for their own safety, and apparently are indifferent to the safety of the men whose duty requires them to keep the road in repair.

This applies particularly to through routes where motorists travel long distances. Almost invariably, on a long trip, a driver strikes a sort of pace before he has gone many miles which he tries to maintain regardless of the fact that his speed should be controlled by visibility, curves, hills, intersections, or city regulations. This characteristic of through traffic makes it hazardous for men working on such roads.

PROTECTED BY SIGNS

The Maintenance Department of the Division of Highways has standardized the signs and barricades, and every effort is made to have such protective devices uniformly placed and used only when actual work is in progress.

Full benefit of the warning can be secured only if the response of the driver to a given sign is almost automatic. If a sign is in place for which there is no apparent reason, the next time a motorist passes a similar sign his natural reaction is to disregard it. If, instead, he finds that every time he passes a "Men and Equipment Working" sign that he shortly passes the crew, he is immediately more alert.

About a year ago instructions were issued that the "Men at Work" and "Equipment at Work" signs were to be placed on the standard tripod in the middle of the traveled way. It was claimed that traffic gave little attention to the signs if placed out on the shoulders.

It was found that this method developed certain hazards to traffic. The signs were frequently struck and knocked down by passing vehicles and occasionally a vehicle in the opposite lane was thereby endangered. Unless a constant watch was kept by the workmen it was never known if the sign was in place. Likewise, on the hard road surfaces the signs were frequently blown over by the wind. Instructions have been issued accordingly.

NEW TYPE ADOPTED

A combined sign reading, "Men and Equipment Working" and a new type of stand consisting of an iron pipe upright supported by an 18-inch steel disc has been adopted. A plain plate is provided with each sign so arranged that the words, "And Equipment" may be concealed when the "Men Working" only is desired. The disc type support is not easily blown over and presents less hazard.

On a two lane road the signs are placed at the right hand edge of the traveled way at each end of and not less than 400 feet from the point where operations are under way. On a road having three or more traffic lanes the particular lane being worked on is blocked off by means of a standard wooden barricade, and the sign is placed immediately in front thereof. Each sign support carries a red flag. The signs are to be placed at time of beginning work, removed at noon, replaced at the

New Official State Map Completed By Water Department

THE official State map which for some months has been in process of compilation by the Division of Water Resources for the Bureau of Publications and Documents of the Department of Finance was completed during March. A newly completed Lambert conformal conic projection was used having its origin at 119° longitude and 37° 30' latitude and the scale is 4 miles to the inch.

Previously existing Federal and State maps generally have paid special attention to legal and political subdivisions without much information as to towns, railroads, highways, etc., whereas the reverse has been true of commercial maps, and most of the maps of both classes were designed to impart information upon a particular subject rather than for use as a base map which would be adapted to the showing of a great variety of data through additions or overprints in color. The new map has been designed to supply this need and will show among other things the following:

Projection Coordinates; State Boundary; County Lines; Rancho Lines; Township Lines; National Forest Boundaries; Indian Reservations; Federal Bird Refuges; Rivers and Creeks; Main Canals; Railroads (Steam and Electric); Cities (Incorporated); County Seats; Towns and Villages; Railroad Stations; Post Offices; Reservoirs above 2000 acre-feet capacity; Lakes and Dry Lake Beds; Principal Mountain Peaks; Principal Points of Coast Line.

IN FOUR SECTIONS

Original sources of information such as the topographic maps of the U. S. Geological Survey and the topographic and National Forest surveys of the U. S. Forest Service have been drawn upon very largely, thus assuring a more accurate location of township corners than the older records of the U. S. Land Office. Great effort has been made to correct all known errors in previously existing base maps and much care was exercised to place all lettering not only so as to break the line work as little as possible, but also so as to leave the way open for adaptation to special uses by additions or the use of overprints.

The map is produced in four sections identified as the Northern, North Central, South Central, and Southern Sections, each of which is complete in itself or may be matched up for mounting with the remaining sections. The State map in its original scale will have an over all dimension of 12 by 15 feet, but it will readily stand reduction to either 8 or 12 miles to the inch and can be read without great effort on a scale of 16 miles to the inch. On a scale of 8 miles to the inch it will have an over all dimension of 6½ by 7½ feet and on a scale of 12 miles to the inch the over all dimension will be 39 by 43 inches.

Distribution of the map will be handled through the Bureau of Publications and Documents, Department of Finance, to which office requests for copies should be addressed. It is expected that the map will find a widespread demand and that the income from sales will reimburse the State for the cost.

Judge: "You have been found guilty of exceeding the speed limit. Which do you want, ten days or ten dollars?"

The culprit: "I'll take the money please."

—Bangor (Me.) Daily News.

Vehicle Miles Total 9,662,000 Daily

(Continued from page 1)

Since it is our wish to be conservative, we will assume that the savings over the entire system are but $\frac{1}{2}$ of the calculated differential or one cent, and that similarly the saving due to operating solely on the improved portion of the highway system is $\frac{1}{2}$ of that shown or $1\frac{1}{2}$ cents per vehicle mile.

JOINT SURVEY

The joint cooperative survey by the U. S. Bureau of Public Roads of the Department of Agriculture which was carried on simultaneously in Arizona, California, Colorado, Idaho, Nebraska, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming, was made to obtain essential facts about the present density, type, capacities, and distribution of traffic units as a basis for planning highway development to serve present and future traffic.

Originally it was planned to secure this information for California at some 48 representative stations; this number was later expanded to 130 stations in order to cover the entire State highway system. The utilization thus determined was the aggregate total of miles traveled each day by all motor vehicles on the State highway system. This total, expressed as vehicle miles, amounted to 9,662,000 daily vehicle miles, or 3,526,630,000 yearly vehicle miles, including all state routes.

The evaluation of this aggregate yearly vehicle mileage for 1930 at the differential of one cent,

assumed as applying to the entire system, would mean a saving of \$35,266,300, which is 10 per cent more than the combined highway expenditures for all purposes in that year.

In any business undertaking, public or private, there must first be an outlay of capital. Then, if the enterprise is to be on a sound basis it must earn enough to pay interest on the capital, to pay the operating and fixed charges and to provide for anticipated renewals and replacements. The building and operating of a highway system is a cooperative enterprise of the people of a state, for which they must furnish the capital, and then must pay individually for the use of the facilities. Their profit comes in lowered vehicle operating costs and in more or less intangible benefits.

TOTAL INVESTMENT

On June 30, 1930, the people of California had a total capital investment of \$172,479,708.08 in their State highways. This amount represents all monies expended in the construction and reconstruction of these roads since their adoption as State highways. The rate and amount of these annual expenditures are shown in the following table from 1912 when the first work began under the 1909 bond issue up to and including 1930, the period covered by the joint survey. This table also shows the aggregate annual sum allowed to cover interest and depreciation on the capital investment during those years.

ANNUAL CALIFORNIA HIGHWAY EXPENDITURES

Year	Construction	Reconstruction	Maintenance	Administration	Theoretical annual fixed charges* Int. @ 5% plus depreciation 5% (thousands)
1912	\$154,195 12				15
1913	1,329,540 99				148
1914	2,371,873 56				386
1915	6,677,309 41		\$98,355 80	\$101,230 90	1,053
1916	6,065,691 79		834,843 50	218,824 08	1,660
1917	1,883,553 30		804,031 76	46,299 30	1,848
1918	4,484,424 74		703,111 84	100,980 60	2,297
1919	4,843,991 43	\$300 64	1,220,254 07	130,231 84	2,781
1920	7,255,432 15	21,592 28	1,457,912 72	42,581 59	3,509
1921	6,731,048 86	19,201 25	2,167,557 72	226,646 15	4,184
1922	13,967,784 70	18,609 15	3,596,359 53	93,938 04	5,582
1923	14,065,996 51	46,298 08	3,840,738 98	204,937 33	6,994
1924	10,449,932 66	1,836,264 68	3,819,333 59	526,722 83	8,222
1925	7,238,560 34	4,369,895 64	3,655,028 22	857,201 76	9,383
1926	5,147,672 27	6,177,279 68	3,780,470 18	754,271 63	10,516
1927	4,188,410 07	6,815,888 53	5,656,244 73	—269,003 77	11,616
1928	3,506,232 55	7,066,121 67	4,462,993 83	1,269,051 97	12,673
1929	11,816,458 30	8,044,528 28	4,926,454 10	274,259 60	14,659
1930	16,951,153 76	8,934,465 69	6,752,845 54	274,259 61	17,248
	\$129,129,262 51	\$43,350,445 57	\$47,776,536 11	\$4,852,433 46	114,774

* Calculated on construction and reconstruction.

\$220,912,500 Savings From 1912 to 1930

(Continued from page 9)

Applying the operating differential of one and one-quarter cents, which was assumed for operating on the improved portion of our highway mileage, to the total aggregate mileage of 17,673,000,000 which resulted solely from operating on the improved portion of the State highway system, the motor vehicle operator up to June 30, 1930, has been saved some \$220,912,500.

The yearly rate of this saving and the miles of improved highway on which it was earned are shown in the following table:

ANNUAL SAVINGS IN VEHICLE OPERATION ON IMPROVED HIGHWAY

Covers Only Fuel and Tires

	Miles of improved highway	Annual vehicle miles on improved highways (thousands)	Annual savings at 1.25 cents per vehicle mile
1913.....	44.6	3,000	\$37,500
1914.....	268.0	20,000	250,000
1915.....	754.3	70,000	875,000
1916.....	1050.3	140,000	1,750,000
1917.....	1144.6	200,000	2,500,000
1918.....	1330.7	260,000	3,250,000
1919.....	1523.9	400,000	5,000,000
1920.....	1766.1	530,000	6,625,000
1921.....	2048.4	750,000	9,375,000
1922.....	2458.9	1,100,000	13,750,000
1923.....	2850.9	1,200,000	15,000,000
1924.....	3129.5	1,300,000	16,250,000
1925.....	3310	1,400,000	17,500,000
1926.....	3856	1,400,000	17,500,000
1927.....	3915*	1,900,000	23,750,000
1928.....	3974	2,000,000	25,000,000
1929.....	4059*	2,500,000	31,250,000
1930.....	4118	2,500,000	31,250,000
		17,673,000	\$220,912,500

*Prorated for biennium.

A summary of the above tabulations justifies the following conservative estimate, in round figures:

Savings by the public in decreased costs for fuel and tires on improved portions only.....	\$221,000,000
Operating expense—	
Maintenance and administration (on entire system).....	\$53,000,000
Depreciation (5% annually on capital investment).....	57,000,000
Interest on investment at 5%.....	57,000,000
	167,000,000
Net savings.....	\$54,000,000
Total capital investment.....	\$172,000,000
Less depreciation.....	57,000,000
Total net value of investment as of June 30, 1930.....	\$115,000,000

On the basis of the depreciation charged, the net value of the investment is \$115,000,000. Unquestion-

ably, a highway system is as subject to depreciation as a manufacturing plant. However, the loss is not certain enough to be readily calculable. Physical deterioration is a question whose ultimate decision rests only in exhaustive investigation.

CONSERVATIVE FIGURE

The rate of depreciation charged, 5 per cent, is equivalent to allowing a life of only 20 years. For highway purposes this rate is probably the maximum, for such costly items as right of way, grading, and drainage have an enduring worth. The statement of a present value of \$115,000,000 is therefore regarded as ultra-conservative.

The investment of \$172,000,000 in California's State highway system has therefore profited its motor vehicle users alone some \$54,000,000, after allowing for operating expense, interest on the investment and depreciation. On the basis of the savings shown the total cost of maintenance on the entire system has been but one-fourth of the returns realized through operation solely on the improved portion of the highways. Furthermore, these returns will increase yearly, being limited only by the amount of traffic using these roads.

The area of the 11 western states included in the joint survey conducted by the United States Bureau of Public Roads represents more than 37 per cent of the area of the United States and more than 35,000 miles of federal aid highways. It was found that the aggregate total daily utilization of the respective state highways by all vehicles, was 23,062,000 daily vehicle miles or 8,400,000,000 yearly vehicle miles. Of this total 7,500,000,000 were passenger car miles and 900,000,000 were truck miles.

Approximately 15 per cent of the total or 1,200,000,000 vehicle miles represented travel by foreign or out of state vehicles. Since the total vehicle miles expresses the general degree to which the roads are used, California with 36.6 per cent of the total aggregate daily vehicle miles shows the greatest highway usage.

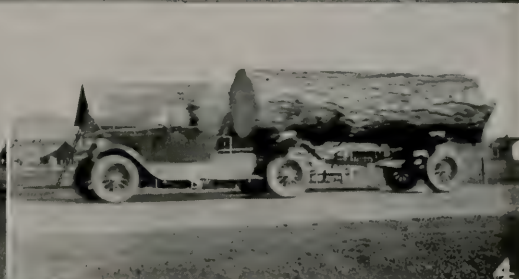
HEAVY TRAFFIC AREAS

The heaviest traffic naturally was recorded on the State highway routes near Los Angeles and San Francisco. The stations used to determine the volume were selected to give, as nearly as possible, the normal average traffic on each route, but of necessity the station locations near one city did not have the same relative locations as those near another city.

The area bounded by the stations near Los Angeles included Pasadena, Hollywood, San Fernando and Santa Monica, as well as Los Angeles. The volume of traffic is shown for six important highways serving this area—U. S. 101 leading east and south from Los Angeles to Whittier, Fullerton, and San Diego; U. S. 101 west from Hollywood toward Ventura and Santa Barbara; U. S. 99 north from San Fernando to Bakersfield; U. S. 66 east from Pasadena to San Bernardino; the State route northeast from San Fernando to Lancaster and Mojave and the State route northwest out of Santa Monica to Ventura.

The most heavily traveled of these routes is U. S. 101 to the east and south with a total volume of traffic between Los Angeles and Whittier of 17,805 vehicles per day, of which 1008 are light trucks of

(Continued on page 12)



BUSY HIGHWAYS, these, returning daily dividends to the people in service and transportation savings. No. 1, week-day traffic using the lanes on the Bayshore Highway at South San Francisco. No. 2 shows U. S. 40 out of Sacramento. No. 3, trucking oil on U. S. 99 near Turlock. No. 4, hauling on Red Bluff-Susanville highway. No. 5, on Grapevine Grade, Ridge Route. No. 6, on Peninsular highway, San Bruno. No. 7, scene on Coast Route north of Santa Monica. No. 8, U. S. 99 near Newhall. No. 9, Placerville-Tahoe highway.

State Shows Greatest Highway Usage

(Continued from page 10)

less than 3-ton capacity and 360 are heavy trucks of 3-ton capacity or greater.

LARGE TOTAL VOLUME

U. S. 101 to the west and north and U. S. 66 to the east also carry large volumes of traffic, the daily average volume on U. S. 101 east near the city limits of Hollywood being 6009 vehicles and that on U. S. 66 east of Pasadena being 8502 vehicles. The total volume on the six routes is 45,588 vehicles per day, an average of 7598 per route.

The San Francisco area includes San Francisco, Sausalito, and the east bay cities of Richmond, Oakland, Alameda, Berkeley and Hayward. The principal routes serving this area are U. S. 101 north from Sausalito toward Santa Rosa, the State route south from Hayward toward San Jose, U. S. 101 south from San Francisco to San Jose, the State routes known as the Bay Shore and the Skyline Boulevard south out of San Francisco, U. S. 40 north from Richmond toward Sacramento and U. S. 50 east from Hayward to Stockton.

The greatest volume of traffic occurs on U. S. 101, the main highway leading south from San Francisco, an average of 11,643 vehicles per day flowing on the section just south of the city near Lawndale. The volume of truck traffic at this point is also heavy, the daily average being 558 light trucks and 102 heavy trucks.

Next in importance is U. S. 40, the daily average north of Richmond being 7815 vehicles. While the total traffic on U. S. 50 to Stockton is slightly less than that on U. S. 40, it is significant that the volume of trucking on this route is greater, averaging 415 light trucks per day and 257 heavy trucks. This volume of trucking is practically equaled on the route

between Oakland and San Jose, but the proportion of heavy trucks is greater on U. S. 50, clearly establishing its importance as a commercial route. The total volume of traffic on the routes entering the San Francisco area averages 46,234 vehicles per day or 6605 per route, somewhat less than the volume of traffic in the Los Angeles area.

PREDICTIONS FOR 1935-40

The joint survey determined that in 1930 California had 50.8 per cent of the total motor vehicle registration of the 11 western states, and consumed 52.2 per cent of their total recorded gasoline consumption. Their predictions, based on the data gathered for California registration and gasoline consumption at the end of 1935 and 1940 respectively, are as follows:

		Per cent increase over 1930
	1935	1930
Registration -----	2,520,000	23.5
Gas consumption ----	1,523,000,000 gals.	31
	1940	Per cent increase over 1930
Registration -----	2,900,000	42.1
Gas consumption ----	1,800,000,000 gals.	54.9

The results of this survey should prove beneficial in acquainting California with the worth of her highway investment. The fact that reconstruction is somewhat behind the calculated depreciation is another point inviting interest, if we desire to keep abreast of the traffic demands forecast by the joint survey, and continue to realize further returns on this investment.

C. R. Montgomery Joins Ranks of Benedicts

Clifford R. Montgomery, attorney and general right of way agent for the Department of Public Works at headquarters in Sacramento, was married in St. James Episcopal Church, Los Angeles, May 22, to Miss Margaret Brandt.

The bride is a daughter of Dr. and Mrs. F. A. Brandt of Los Angeles. She is a graduate of the University of California at Los Angeles and a member of the Delta Gamma sorority.

Mr. Montgomery is the son of Mr. and Mrs. John S. Montgomery of Lodi, and a graduate of Stanford where he received his J.D. degree in 1930. He is a member of Beta Theta Pi, Phi Beta Kappa, Phi Delta Phi and Order of the Coif. He was connected with a large law firm in Los Angeles before becoming associated with the legal department of the Division of Highways last year.

Highways in U. S. Now Total 223,000 Miles

Federal Aid Highway construction mileage has increased from 169,000 in 1923 to 199,000 at the present time in the United States, it is noted in a report reaching the Automobile Club of Southern California. In 1923 the roads composing the highway systems of the states which also include the Federal Aid system, totaled 203,000 miles, and now the total is about 120,000 greater.

Much of this additional mileage on the state systems consists of roads taken over from counties and townships.

At the peak of the road-building season there were 155,000 men engaged in the construction of Federal-Aid highways, according to government reports.

A new driver writes in to ask what stops a car skidding.

Well, usually it's another car or a conveniently placed telegraph pole.—*Motor Land*.

Getting at the Core of Pavements for Laboratory Analysis

IT IS the practice of the California Division of Highways to cut cores from the finished pavement whenever it is desired to test the work for strength and thickness, and also in order to show how thoroughly the concrete was mixed and placed at the time of laying.

In this way records can not only be secured of the quality of the pavement at the



SAMPLING HIGHWAYS is the job of Art Savage. With this truck and trailer equipped with a power drill he takes pavement cores five inches in diameter for tests by State engineers.

time it is completed but also test analysis can be made at greater ages in order to secure information as to how any particular type of construction is standing up with age.

Cores were recently cut in the San Joaquin Valley from concrete pavement which was constructed 20 years ago in 1912.

The outfit used for the purpose cuts a cylindrical core approximately five inches in diameter, using a section of 5-inch pipe for the cutting tool and crushed steel or chilled steel shot as an abrasive. The crushed steel which generally comes in finer particles than the steel shot cuts a core with a much

GOOD BUSINESS TO KEEP GOING IN 1932

Stabilization of highway programs and income are absolutely essential to the orderly progress of highway transportation.

It is certainly good business to continue road improvement at a steady pace during 1932, while the road dollar will buy more construction value than ever before and probably more than it will buy for many years to come.

Road building has not only aided the industries directly engaged in construction, materials and machinery but it has increased the value of motor vehicles, sustaining the automobile and truck industry.—*American Road Builder.*

"MEN AND EQUIPMENT WORKING" SIGNS MEAN PROTECTION TO CREWS

(Continued from page 8)

end of the noon hour, and removed at the end of the day's work.

When trucks or tractors are engaged in pulling graders over considerable distances a sign is placed at the edge of the traveled way at the beginning and end of the section being worked over.

RED FLAG CODE

Particular stress is laid on the importance of spotting working equipment in such positions as will create the least traffic hazard. Each piece of equipment is equipped with a red flag front and rear.

Flagmen are employed wherever power shovels or trucks are operating in the traveled way at locations with restricted view, or wherever traffic is restricted. Red flags are used only in slowing down or stopping traffic. When traffic is signaled to go the flag is held behind the flagman's back and the advance signal given with the free arm and hand.

On certain sections of mountain road where a single piece of grading equipment may operate over a long distance, where it would be impractical to place and remove the temporary sign daily, a large sign reading as follows is placed at appropriate points: Grading Equipment Working Next (-----) Miles. 7.30 A.M. to 4 P.M. Excepting Sundays and Holidays.

smoother and neater surface than the steel shot.

Where the rock in the concrete pavement is extremely hard and tough it takes from 30 to 60 minutes to cut a core from a pavement five to six inches thick. Where the concrete has been constructed from gravel which consists largely of indurated sandstone only about 10 to 15 minutes is required to cut the same thickness of core.

The cores are tested for compressive strength by crushing at the laboratory, using the large laboratory compression machines for the purpose.

“Follow the Leader” Traffic Control Plan Effective in Oiling Operations

By **W. A. SMITH** Assistant Maintenance Engineer

IN THE early days of the use of light asphaltic oils as dust palliatives, the practice was almost abandoned due to hundreds of complaints from the traveling public. No particular provision was made to protect traffic, and when a machine passed over a freshly oiled section of road it was covered with oil, and an expensive washing job was necessary. Likewise the clothes and features of the occupants of the car were apt to be in the same condition.

Efforts to control the matter were tried first by placing numerous warning signs, and by stationing a flagman at each end of the job. He was provided with printed cards to hand out. The cards requested that the motorist drive slowly through the oiled section. This method might have worked successfully, except for the occasional thoughtless or reckless individual who drove out on the fresh oil at high speed and spattered each car as he passed.

CONTROL ESTABLISHED

Determined to effectively control this situation, the Maintenance Department of the Division of Highways developed a system of passing traffic through oiling operations under one-way control. The system is as follows:

Before oiling is started a barricade is erected at each end of the section of road to be controlled. In general the barricades are not more than three miles apart, to limit the period traffic will have to wait. A large painted wooden sign advising the motorist as to conditions is placed at each barricade, and smaller pasteboard “Caution” signs are placed at frequent intervals within the barricaded portion. A flagman is stationed at each barricade, and a pilot car with driver is provided to conduct traffic through the work. This car carries a sign on the rear which reads “Follow but do not pass this car.”

Oil is spread and covered on one side of the road at a time, leaving the other half for traffic.

HOW PLAN WORKS

When oiling starts the flagman at one end holds up traffic while the pilot car conducts a line of cars through the work from the other end. A red flag is handed to the driver of the last car in the line for delivery to the flagman at the far control. When the control is reached the travelers go serenely on their way, and the pilot turns about and conducts another convoy to the starting point.

After one side of the road has been oiled and covered so there is no possibility of picking up oil, traffic is transferred to that side, and the other half is then treated.

If an impatient driver insists on passing the control car over the fresh oil between control points, his number is taken and record is made of the circumstances. Excellent cooperation has been received from traffic officers, who make it a point to visit the controls at frequent intervals. Several instances of citation and fining of drivers who disregarded the control regulations have materially assisted in educating the more reckless.

LITTLE TIME LOST

The advantage of the pilot control is in regulating the speed and in keeping traffic in a single compact line. If oil runs across into the lane of travel, the control car holds up traffic until the fresh oil can be covered. Likewise if a spreader truck or other equipment is working or turning, traffic is stopped until it can pass without being spattered with oil, and without danger. In order to keep delays to a minimum the barricades are moved up as soon as conditions justify. In general a control period of about ten minutes is all the time lost by traffic.



W. A. SMITH



Warrant Brings Bridge Chief to Dedication

In the course of his official duties, F. W. Panhorst, Acting Bridge Engineer of the Department of Public Works, has occasionally been summoned to court on civil matters but his first experience of being "haled" under a warrant for a criminal offense came in connection with the recent dedication of the Napa Bridge.

A few days before that event Mr. Panhorst visited Napa for final inspection of the bridge and some matter arose in which the cooperation of the fire department was desirable. A night visit to headquarters was necessary to see Fire Chief C. F. Otterson. In company with J. Kenny, superintendent for the bridge contractor, Mr. Panhorst went there and found everything dark and locked up. Someone set off the fire alarm and out rushed the chief pulling on his apparel, ready for action and mad as a hornet when he learned it was a false alarm.

The atmosphere was soon cleared by explanation and smiles and in parting the chief asked Panhorst if he would see him again at the dedication exercises. Panhorst regretted he couldn't possibly make it.

A day prior to the gala event Panhorst was served with a warrant sworn out by Otterson charging him with violation of the law by "tampering with a fire alarm" and ordered to appear in court on the morning of the bridge dedication under penalty of going to jail or paying a large fine.

Panhorst duly presented himself and was sentenced to attend all the dedication functions which he agreed to do to the accompaniment of more smiles, mostly by Otterson and Judge A. C. Handel.

The cost of handling traffic by this means is considerable during an oiling season, but the benefits far outweigh the cost. The cost of washing and polishing a few machines, to say nothing of damage to oil-spattered clothing, and loss of pleasure in the trip, are items not to be neglected.

Since the inauguration of the control system practically no complaints have been received. The proper handling of traffic has become as much a part of the work as is the arrangement for material for the job.

In the smoking room of the big hotel the Scot had been boring everyone with tales of the great deeds he had done.

"Well, now," said an Englishman at last, "suppose you tell us something you can't do, and by jove, I'll undertake to do it myself."

"Thank ye," replied the Scot. "I canna pay my bill here."—*Borrow Pit.*

The watchman testifying on the stand told about the most graphic story possible in one sentence when he was asked by the lawyer what he said when he saw the automobile approaching.

"I said," was the answer "that is a fine car,—wasn't it?"—*Arizona Highways.*

Sixteen Major Projects in Highway Program Advertised During Month

/ / / / / /

COLONEL Walter E. Garrison, Director of the Department of Public Works, announced that during the month of May the Division of Highways planned to advertise sixteen major projects, for construction on State highways, at an estimated cost of more than \$2,600,000.

These projects include ten road jobs and six bridges. The road projects cover work on some 71 miles of State highway, amounting to approximately \$1,874,000, and the proposed bridges are estimated to cost about \$730,000. The work is distributed well over the State from San Diego to Siskiyou counties and involves work in fourteen counties.

The following summary and brief descriptions of projects planned for advertising during the month show the scope of the proposed work which will carry forward the 1932 State highway construction program:

In Contra Costa County an important improvement is to be made to the State highway, which leads from the San Francisco Bay area to the Napa and Sacramento valleys via the Carquinez Bridge, between the town of San Pablo and the bridge. This project will involve the placing of a new 30-foot pavement over the entire distance with the exception of some 1100 feet in the business section of the town of Pinole, which was paved with Portland cement concrete pavement some three years ago.

MAJOR LINE CHANGES

Much of the existing alignment and grade will be greatly improved and two major line changes are included. One of these major changes involves the relocation of the highway within the town of San Pablo and up the slopes of the first range of hills. The other radical change in alignment lies between Hercules and Rodeo; the new routing leaves the existing road at Refugio Creek and cuts through the Hercules Powder Farm to the town of Rodeo in a nearly straight line.

This second major line change saves more than one mile in distance over the present location and will provide a full 30-foot pavement with a 46-foot roadbed. The pavement will be asphalt concrete throughout, except

on the steeper grades where Portland cement concrete pavement will be used. It will eliminate all rough pavement, high crown and excessive superelevation on curves between the northerly end of San Pablo Avenue and the Carquinez Bridge.

A project of great interest to thousands of southern California motorists will be put under way when work is begun on the easterly end of the new Pomona-Los Angeles Lateral. This new highway is one of the important secondary roads in southern California incorporated in the State highway system by the 1931 Legislature.

CONTINUES IMPROVEMENT

In the construction of this new thoroughfare the State will carry forward the work which has been started by the Los Angeles County Road Department. The surveys made by the county have met with the standards of the Division of Highways and the plans for the present project have been prepared by the State on the basis of the county's preliminary work.

The project proposed for advertising this month involves construction on this new route over the six miles westerly of Pomona. The new highway will consist of a Portland cement concrete pavement 30 feet wide on a graded roadbed, 50 and 80 feet wide. The standards of alignment, grade and construction will meet the modern requirements for suburban boulevards and will provide this section of southern California with an excellent high-speed lateral.

Where the Pacific Highway crosses Cottonwood Creek in Siskiyou County about 21 miles north of Yreka, the new 120-foot reinforced concrete bridge has just been completed and the construction of the approaches is now to be started. The approaches will be about 0.8 of a mile in length and follow the improved alignment upon which the new bridge was placed. The new approaches will consist of a graded roadbed 31 feet wide surfaced with untreated crushed rock 22 feet wide with a bituminous treated crushed rock wearing course 20 feet in width.

This improvement to this interstate arterial, which carries the bulk of traffic between

(Continued on page 30)

Work Advanced to Bids in May

The schedule of projects proposed by the Division of Highways to be advertised for bids prior to June 1, 1932, included sixteen major improvements in fourteen counties at an estimated total cost of approximately \$2,604,950. The proposed work covered some 71 miles of road surfacing and paving and six bridges as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type
Ventura	Montalvo to Oxnard	2.4	A. C. & P. C. C. P.
Contra Costa	San Pablo to Carquinez Bridge	10.6	A. C. & P. C. C. P.
Yolo	Swingle to Yolo Causeway	1.7	P. C. C. Pave.
Los Angeles	Barranca St. to Pomona	6.0	P. C. C. Pave.
Del Norte	Crescent City to Madrona Camp	6.9	Bit. Tr. Cr. Rk. S.
San Luis Obispo	Cambria to San Simeon	9.7	Bit. Tr. Cr. Rk. S.
San Bernardino	Halloran Summit to Moun- tain Pass	16.5	Bit. Tr. Cr. Rk. S.
Sacramento	McConnell to Sacramento	11.9	Bit. Tr. Cr. Rk. B.
Siskiyou	At Cottonwood Creek	0.8	Bit. Tr. Cr. Rk. S.
Amador	Drytown to Martell	4.8	Bit. Tr. Cr. Rk. S.
San Luis Obispo	Across San Simeon Creek	---	2 Steel & Conc. Br.
Monterey	Across Wild Cat Creek	---	Stone faced arch B.
San Joaquin- Stanislaus	Across Stanislaus River	---	Conc. & Steel Br.
San Joaquin	Across Paradise Cut	---	Steel Stringer Br.
Ventura	Across Ventura River	---	R. C. Girder Br.
San Diego	Sorrento Canyon Overpass	---	R. C. Girder Over- head

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement.....	10.8	\$1,017,900
Asphalt Concrete Pavement.....	9.9	
Bituminous Treated Crushed Rock Surfacing.....	50.6	856,200
Bridges	(6)	730,850
Totals	71.3	\$2,604,950

Highway Tunnel Under Railroad and Town at Newcastle Opened to Traffic

By **CHARLES H. WHITMORE**, District Engineer

THE LAST two years have realized the elimination of the poorly aligned highway with excessive and adverse grades by the reconstruction of a portion of the Primary State Highway System in Placer County between one-half mile west of Newcastle and Auburn.

This unit of improvement is a portion of the main trancontinental route, "Victory Highway," United States Route 40, State of California Route 37, situated in the foothills of the Sierra Nevada Mountains in the rich fruit regions of Placer County.

The new highway, 4.1 miles in length, is 1520 feet shorter than the old road and is paved with Portland cement concrete on a thirty-six-foot graded roadbed. The new alignment consists of long tangents with a fifteen hundred-foot minimum radius curve as compared to a fifty-foot minimum radius curve on the old road. The new road uses a maximum grade of 5.68 per cent as compared to a maximum 8 per cent on the old road.

TUNNEL UNDER TOWN

A special feature of this improvement is the construction of a highway tunnel underneath the main east-west lines of the Southern Pacific Railroad and a portion of the town of Newcastle. The parabolic arch tunnel is five hundred thirty-one feet long and has a vertical clearance of twenty feet nine inches at the center line of the roadbed.

The tunnel is lined throughout with reinforced Portland cement concrete fourteen inches thick at the top, increasing to twenty-four inches at a point five feet above the pavement, thence increasing to about four feet at the base. Through the tunnel and approach cuts at both ends, the roadbed is thirty-six feet wide providing a pavement thirty feet wide with pedestrian sidewalks and curbs three feet wide on each side. Contigu-

ous to the thirty-foot-pavement, the pavement is twenty feet wide.

The elevation of the pavement in the tunnel is about eighty-six feet below the grade of the railroad tracks.

The driving, lining, painting, lighting, etc., of the tunnel was executed at a cost of \$130,000. The pavement, concrete sidewalks and curbs approaching and through the tunnel were constructed at a cost of approximately 46,000.

The reconstruction between one-half mile west of Newcastle and Auburn was performed under four separate contracts financed from the State Highway Reconstruction Fund for the 81st, 82d, 83d, and 84th Fiscal Years at a cost of approximately \$560,000.

The first portion of reconstruction consisted of one and two-tenths miles of grading, between one-half mile west of Newcastle and one-half mile east thereof, including driving and lining the tunnel. The second contract was for the construction of a timber bridge at Auburn Ravine one-half mile west of Auburn. J. W. Trask was Resident Engineer on both contracts.

The third contract embraced one and thirty-five hundredths (1.35) miles of grading and Portland cement concrete pavement between Wise Power House and Auburn and the fourth contract was two and seven-tenths miles in length, consisting of grading and Portland cement concrete pavement between one-half mile west of Newcastle and Wise Power House, with W. G. Tinney Resident Engineer on both contracts. (This mileage includes the 1.2 miles of the first contract.)

The first work was started September 2, 1930. The completed paving was opened to public travel on May 14, 1932.

The surveys, designs, estimates, plans, specifications, and construction were under the administration of Charles H. Whitmore.



C. H. WHITMORE



UNDER THE TOP, goes the new highway through Newcastle via the recently completed tunnel beneath the town and railroad. The old route up over the hill is seen on the left.



BROAD AND SMOOTH is the way now through the west portal of the Newcastle bore.



TIME AND MONEY saving to motorists are evidenced by this view from the East portal.



Map showing direct routing through Newcastle by new tunnel.

Master Plan of New State Hospital in South Provides for 5000 Patients

By **GEORGE B. McDOUGALL**, A. I. A., State Architect

ON APRIL 29, 1932, the Site Commission composed of Dr. J. M. Toner, Director of Institutions, Chairman; Colonel Walter E. Garrison, Director of Public Works; Rolland A. Vandegrift, Director of Finance; Mrs. Carrie Parsons Bryant of Los Angeles and Herman Michel of Santa Monica selected a site known as the Lewis Ranch for the new State hospital for insane to be established in southern California.

This site consists of about 1500 acres and is located in Ventura County about two miles from the town of Camarillo on the Coast highway which is about 17 miles south of Ventura and about 56 miles north of Los Angeles. The site is about 5 miles from the ocean measured on a straight line.

There is abundant water of good quality, the soil is good and the climate is cool in summer and mild in winter. There is an ample area of farming land.

PICTURESQUE SETTING

The natural contours of the building site itself and the relation to it of the surrounding hills are such as to provide an unusually picturesque setting for the buildings which will be located on rising ground and will be approached from the entrance lying on somewhat lower ground. These hills besides adding to the picturesqueness of the building group will provide effective protection against such winds and fogs as usually occur along the coast.

While the farming lands will be comparatively close to the building site the building group itself with its lawns, gardens and foliage will nevertheless be isolated by the surrounding hills.

The dairy, piggery and poultry activities will be entirely separate from the main institution.

Since the new institution will be a part of the State Department of Institutions, its development on the selected site will be cared for under the direction of that department. The Division of Architecture of the Department of Public Works will care for the architectural and engineering work involved in the design and construction of the buildings and other structures required.

TENTATIVE BUDGET

After deducting the cost of the site there remains available for construction purposes the sum of about \$1,030,000 for the expenditure of which the following is a tentative budget:

1. Unit for 400 patients	\$350,000
2. Unit for 400 patients	350,000
3. Employees quarters and garages	100,000
4. Commissary storage	15,000
5. Main entrance road	25,000
6. Sewage disposal plant first unit	50,000
7. Sewage collection	10,000
8. Domestic water development and distribution	25,000
9. Gas service	7,000
10. Electric service and telephone	10,000
11. Roads, walks, sprinkling systems and landscaping	25,000
12. Reserve	63,000

Total.....\$1,030,000

This expenditure, work under which it is expected will be started during the late summer or early fall of 1932, will provide living quarters for 800 patients and for the necessary employees to care for them.

Due to the availability of low-cost natural gas there will be no central heating plant, each of the buildings will be self-contained as to heat generation.

FUTURE NEEDS

Future needs to be provided for by the 1933 and later Legislatures will include besides additional units for patients, the following essential accessory projects and buildings:



GEORGE B. McDOUGALL

Ten Year Hospital Building Program

(Continued from preceding page)

1. Flood control	\$40,000
2. Main entrance bridge	25,000
3. Building to contain kitchen, three dining rooms, bakery and refrigeration	100,000
4. Administration Building with temporary quarters for Superintendent and As- sistant Superintendent	50,000
5. Laundry building and equipment	50,000
6. Farm group	75,000
(Dairy, piggery, poultry, horse barn, implement storage and blacksmith shop)	
7. Fire protection	10,000
8. Industrial buildings	50,000
9. Superintendent's residence	30,000
10. Two cottages with garages for Assistant Physicians	25,000
11. Manor House for unmarried employees	35,000
12. Receiving and hospital building	200,000
13. Assembly Hall	100,000
14. School and gymnasium	75,000
15. Recreation building for employees	50,000
Total	\$915,000

Since it is intended that the institution shall ultimately have capacity for 5000 patients, the cost of additional units for patients and of other buildings required added to the approximate figure of \$2,000,000 for the items above listed would bring the probable ultimate cost of the institution for construction only, to approximately \$7,000,000.

TEN YEAR PROGRAM

This total expenditure in accordance with the State's policy of caring for such development out of current funds will probably be made under a building construction program extending over a period of approximately ten years.

The master plan to determine the ultimate development of the institution is now being made on the basis of an ultimate patient capacity of 5000 as already stated. The area of the building site is such as to permit of an increase of this number to 6500 or 7000 should this be found desirable at any time in the future.

The structures for patients are being laid out partly in accordance with the plan of two two-story units just completed at the Agnews State Hospital Farm near San Francisco and partly in accordance with a one-story unit recently completed at the Patton State Hospital near San Bernardino. There will be ample provision for the more infirm patients in the one-story structures giving these patients the easiest possible access into and out of the buildings. This will give them the benefit of being in the open as much of the time as practicable.

MASTER PLAN

The exterior design of the buildings will be in agreement with the southern California adaptation of the Mediterranean styles of Spain and Italy.

Surveying parties have already been in the field for sometime gathering data for plotting the contours of the site. While the surveys are being made the master plan is being determined upon.

FAMILY HEAD GRATEFUL FOR RELIEF QUOTA JOB

S. V. Cortelyou,
District Engineer,
Los Angeles.

Dear Sir:

I must answer your card of April 14, 1932, advising me of finishing our work about May 15th, under Mr. Frank Pfeffer.

I was very sorry to receive this notice, but must say I thank you, Mr. Pfeffer and all connected in Division of Highways Department.

The wages I have earned through this work this winter have certainly been a God's gift, as I don't see how I could have fed my family of six without this work, and certainly hope it will not be long before the State can employ us again if things or work does not improve, and work is as scarce in San Diego now, if not worse, than it was last October.

As I have two girls in high school now and this maintenance fund has been exhausted, I am afraid I shall have to take them out of school, as much as I hate to.

JOHN F. OFFDENKAMP,
San Diego.

ENGLISH-SPANISH ROAD TERMS

English-Spanish terms used in the construction of highways have been prepared by the American Road Builders' Association in cooperation with leading authorities on the current use in Spanish-American countries.

This glossary attempts a standardization of usage which varies decidedly in different Spanish-American countries. The Spanish equivalents of 2100 English technical terms used in highway construction and maintenance are given. In a number of cases, several Spanish words are used for a single English word, varying in the different Spanish-American countries.

For example, the word "bureau" in Porto Rico is "negociado," in another country "agencia," in still another "oficina," and another "departamento."

In the meantime representatives of the Department of Institutions together with the State Architect are making a trip to view the newest institutions in this country for the care of insane so that the latest developments in provision for them may be carried into the new California institution.

The physical characteristics of the new institution both as to its site and as to the buildings and surrounding developments, will be such as to contribute in an important measure to the rehabilitation and restoration of the largest possible number of the patients committed to it.

High Standard of Road Alignment

(Continued from page 6)

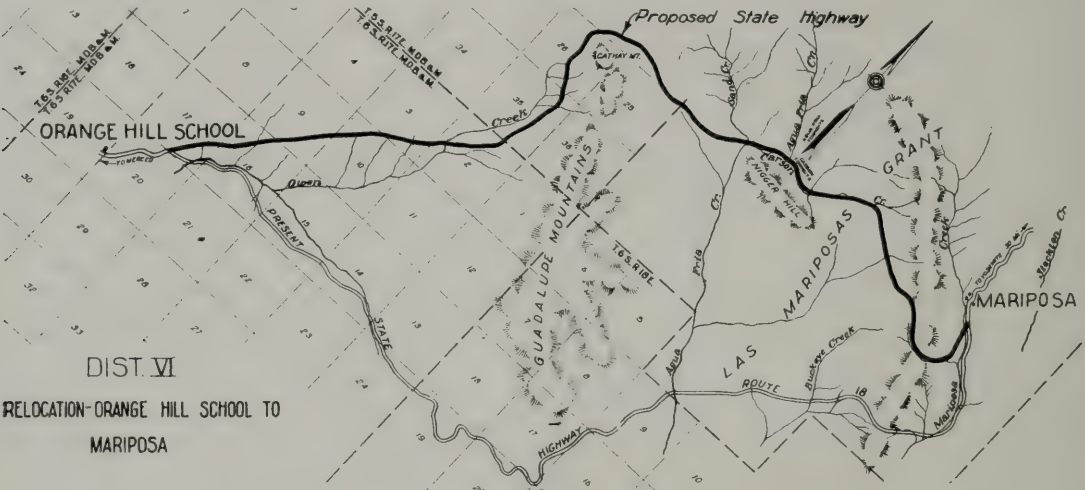
fore most of them soon became public property. In 1874 it was possible to make the trip by carriage over what was then called a good stage road.

A gradual improvement took place but with the beginning of automobile travel and especially the completing of the "All-Year Route" in 1926 travel time to this famous park became a matter of hours instead of days, and as many as 150,000 vehicles entered the Valley in a recent year. The State re-

during the winter of 1930. Contract No. 26EC4 is now in progress completing the work within the same limits. The remaining part was recently let to contracts.

Specifications for the improvement call for a 24-foot graded roadbed. As the present road is available for travel no provision for surfacing the new alignment will be made until grading is completed in spring of 1933.

A comparison of curvature and grades follows:



Map showing new highway route through old town of Carson.

granted the Yosemite to the United States as a National Park in 1905.

As an engineering improvement the new location from Orange Hill School to Mariposa was made necessary by the higher standard of alignment demanded today. The present location, built in 1918, used curves as sharp as 60 feet radius with large angles in crossing the many deep draws. To replace these hairpin turns with modern easy curves would be prohibitive in cost.

The line was therefore rerouted nearer the sources of the streams, where the canyons are not so deeply eroded and the alignment is largely parallel with the drainage rather than across.

LAST CONTRACT LET

The plans of the relocation are now complete and approved. A portion of the construction, Orange Hill School to Pain Flat was accomplished by a day labor relief camp

COMPARISON OF ROUTES

	Existing location	Carson Route (New location)
Length—Miles	17.5	15.0
Elevation—Maximum	1938 ft.	2445 ft.
Curves—Less than 500 ft. radius	201	0
Curvature—Total—Degrees	10,639	1,710
Total Number Curves	232	48
Minimum Radius	80	500
Roadbed Width	18 ft.	24 ft.

MAKING GLASS BRICKS

Glass bricks, somewhat stronger in comparison than clay bricks, that freely admit light but prevent outsiders from looking through them, were demonstrated at a recent meeting of the American Institute of Architects by a consulting chemical engineer for a glass works.

The "glass bricks," he said "have a high degree of heat resistance. They will be used for decorative and ornamental effects and will be especially useful for buildings with modern air conditioning as they will permit full natural daytime lighting without the heat losses caused by most types of windows."

Secondary Highway Requests Total 12 Times Mileage Quota

THAT California wants more roads, and plenty more, is evidenced by the fact that the additional mileage requested for inclusion in the secondary highway system of the State in 1933 totals more than twelve times the maximum total mileage that can be added under the law as passed by the last Legislature.

This fact was clearly set forth last week by Chairman Earl Lee Kelly of the California Highway Commission in letters sent to sponsor of additional secondary roads. The letter analyzes the status of the secondary mileage situation as follows:

"Concerning the mileage which may be added to the State system at the next session of the Legislature, in concurrent resolution, Senate Concurrent Resolution No. 10, Chapter 58 of the 1931 statutes, provides that 15 per cent of the existing secondary mileage under Chapter 794 of the 1927 statutes, is to be considered for addition. This is to be added in the ratio of three or four miles in the south to one mile in the north. On January 1, 1932, the total secondary mileage in the State highway system was 2302.8 miles. Fifteen per cent of this amount is 345.4 miles. The total, then which can be added to the State system at the next session of the Legislature is 345.4 miles.

"On a ratio of three to one, this would provide 259.1 miles in the south and 86.3 miles in the north. On the ratio of four to one, it would be 276.3 miles in the south and 69.1 miles in the north. In other words, from 69 to 86 miles may be added in the north and from 259 to 276 miles in the south, so long as the total does not exceed 345.4 miles.

"The California Highway Commission has received requests for the inclusion of 2372 miles in the north and 2073 miles in the south, a total of 4445 miles from which must be selected the 345.4 permissible mileage for recommendation to the next Legislature. And all this excess mileage has been urged at meetings of the Commission by delegates of county and municipal officials and State civic bodies supported by resolutions of numerous smaller organizations."

The wholesale value of cars produced in the United States last year was \$1,175,000,000, according to figures received from the Automobile Chamber of Commerce. The value of trucks produced was \$260,000,000.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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MAY, 1932

No. 5

WHAT PRICE ECONOMY?

All over the land merchants, manufacturers and banks are looking hopefully to the day when the consumer's dollars will come trooping into the market place in greater numbers; they are watching for the "revival of business." But business must wait upon the buyers, i.e., the consumer with dollars to spend.

The consumer's dollars are born of his earnings, either as wages, salaries, interest or dividends. And during the last year or more private business has been a bit shy on earnings. So consumers' dollars from that source have been rather scarce. Then, too, it is difficult for private industry, especially the manufacturer of consumer goods, to pay out more wages and salaries without at the same time producing more goods that must be bought.

But the construction of public works has been providing the wherewithal to keep a lot of consumers in the market place, and to do it without producing any more goods to be bought. In other words, the public works programs have provided a most helpful backlog of buying power during the recession of private industry.

Now, we are told by some of these merchants, manufacturers and bankers that we should suspend or curtail our public works construction. They want to "slash governmental expenditures." They do not distinguish between administrative expenses and capital investments. They just want to "cut the cost of government," to stop the provision of essential community facilities, to add to the roll of the unemployed some more of the consumers who still are able to buy their goods. And all this is to "reduce the burden of taxes."—*Construction Methods.*

State, Waging War on Puncture Vine, Experiments With Earth Sterilization

PUNCTURE VINE is one of the most serious infestations of noxious weeds with which agriculture in this State has to contend. Colonel Walter E. Garrison, Director of the Department of Public Works, in full realization of this fact has instructed that no effort be spared in controlling the spread of this pest along the State highway right of way.

Puncture vine smothers field crops, increases harvesting cost of grapes, cotton, etc., lowers grade of hay, wool and cotton, and reduces land values as well as creating local restrictions on movement of farm products.

The plant thrives in hot weather. Seeds mature within less than two weeks of the time the plant starts out of the ground, and seeds do not appear all at once, but continuously throughout the season, giving a succession of plants in all stages from spring to fall.

CAN'T DODGE SPURS

The fruit of the vine is a star shaped bur cluster which splits into five burs or nutlets when it matures. Each bur has two spines so arranged that one spine always points upward. A single average plant will bear about 100 burs to the square foot during a season.

The spines on the burs attach themselves to automobile tires, live stock, hay, bedding, gravel ballast, and the seed is also disseminated by irrigation water, agricultural seed, etc. The infestation is easily spread, and is usually first found about railroad yards and along the highway.

The Division of Highways forces have co-operated with farmers and other organizations in efforts to control the pest during the past seven years. From \$8,000 to \$10,000 of highway funds have been expended for the purpose annually during that period.

Control measures consist of the cultivation of the ground whenever young plants appear and before burs form, or by spraying with Diesel oil at regular intervals of ten days to prevent development of seed.

The most serious infestation occurs in the San Joaquin Valley, and in certain desert

sections. Along the coast only an occasional patch is found, while in the northern interior counties control is still easily possible. The principal effort in these sections is to keep interest alive, and each organization on the alert to stamp out each appearance of the pest.

The Division of Highways maintenance organization is charged with the responsibility of controlling the areas of the highway right of way. Power spray and knapsack type outfits have been provided in the districts where extensive work is necessary. In other sections the knapsack type spray outfits used on roadside burning operations are available. Diesel oil of 27+ gravity is is mainly used on the work.

Instructions have been issued that each section is to be patrolled throughout the season and spraying or cultivation carried on at ten-day intervals wherever infestation is found. Record is made of all infested areas.

STERILIZING EXPERIMENT

In addition to these measures an experiment is under way looking toward the possibility of sterilizing the soil in heavily infested areas by the use of sodium chlorate. A half-mile section in Kern County has recently been treated, and results will be carefully watched.

The State Arboriculturist has been assigned to general supervision of initial measures throughout the State for the Division of Highways.

Meetings have been held between the Maintenance Engineers, Superintendents, and the Agricultural Commissioners of the counties, in order that each one may be advised of the proper methods and to insure the most complete cooperation between the two agencies.

Old Maid: "Has the canary had its bath?"
Servant: "Yes, he has, mum. You can come in now."
—*North Dakota Highway Bulletin.*

Policeman—I've had my eye on you for some time, Miss.
Girl—Fancy that! And I thought you were arresting me for speeding.—*Motor Land.*

An infernal machine is any kind of motor vehicle that ambles along the middle of the road at just about ten miles per hour.



SPREADING POISON for the Puncture Vine, this outfit of truck and trailer equipped with tank and spray pump is being used in an earth sterilization experiment.



FULLY ARMED with spurs on every side is the Puncture Vine bur, nemesis of automobile tires, and there is always one spur topside, ready for action.



PACKING A KNAPSACK style tank, the sprayer attacks spots otherwise unreachable by hose.

Highway Bids and Awards for April

AMADOR, ALPINE, EL DORADO COUNTIES—Dist. X, Rts. 34 and 23. Between Chapman and Picketts Jct. Between Picketts and Alpine Jcts. and between Picketts Jct. and Hangmans Br. about 80 miles to be treated with fuel oil and asphaltic road oil. Force Const. Co., Piedmont, \$23,855; Clyde W. Wood, Stockton, \$23,703.75; Basalt Rock Co., Inc., Napa, \$22,289.70; Tiffany, McReynolds, Tiffany, San Jose, \$21,046.75. Contract awarded to C. F. Fredericksen & Sons, Lower Lake, \$19,583.45.

BUTTE AND PLUMAS COUNTIES—Dist. III, Rt. 21. About 40.9 miles to be treated with oil as a dust palliative. Oilfields Trucking Co., Taft, \$7,838.95; Skeels & Graham Co., Roseville, \$8,209.50; C. F. Fredericksen & Sons, Lower Lake, \$7,638.95. Contract awarded to Basalt Rock Co., Inc., Napa, \$7,263.30.

CONTRA COSTA COUNTY—Dist. IV, Mt. Diablo Park Road. Furnishing and applying fuel oil as a dust palliative between Danville and the Summit and between the Forks and Walnut Creek, about 19.1 miles. Hutchinson Co., Oakland, \$4,450; Lee J. Immel, Berkeley, \$3,697.50; Edward A. Peres, Richmond, \$4,350; Helwig Const. Co., Sebastopol, \$3,875; U. B. Lee, San Leandro, \$3,575; Granite Const. Co., Ltd., Watsonville, \$4,350; C. F. Fredericksen & Sons, Lower Lake, \$3,400; Oilfields Trucking Co., Taft, \$3,775; Basalt Rock Co., Inc., Napa, \$3,275; Jack Casson, Hayward, \$3,350. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$3,075.

FRESNO AND KINGS COUNTIES—Dist. VI, Rt. 10. Between Coalinga and Hanford, 50 miles of shoulder dust oiling. Stewart & Nuss, Inc., Fresno, \$10,128; A. Teichert & Son, Inc., Sacramento, \$13,920; Hartman Construction Co., Bakersfield, \$15,840; Granite Construction Co., Ltd., Watsonville, \$11,232; Fred W. Nighbert, Bakersfield, \$13,440. Contract awarded to Oilfields Trucking Co., Taft, \$7,632.

GLENN COUNTY—Dist. III, Rt. 7. In Willows, 0.4 mile to be graded and paved with A. C. A. Teichert & Son, Inc., Sacramento, \$23,887. Contract awarded to Clark & Henery Construction Co., San Francisco, \$21,843.30.

KERN AND INYO COUNTIES—Dist. IX, Rt. 23. 175 miles paint 4-inch traffic stripe. B. G. Carroll, San Diego, \$1,048.25. Awarded contract.

KERN COUNTY—Dist. VI, Rt. 58. Between Bakersfield and Junction Arvin Rd., 11.1 miles shoulder oiling; 1 mile Bit. treated gravel or stone Surf. placed; 14.5 miles dust oiling. Hartman Const. Co., Bakersfield, \$12,923.55; F. W. Nighbert, Bakersfield, \$11,261.10; Square Oil Co., Inc., \$14,989; Oilfield Trucking Co., Taft, \$11,686; Stewart & Nuss, Inc., Fresno, \$9,668.70. Contract awarded to Granite Const. Co., Ltd., \$9,491.55.

KERN COUNTY—Dist. VI, Rt. 57. Between westerly boundary of Kern Co. and 2.7 miles west of Maricopa, 9.5 miles dust oiling. Stewart & Nuss, Inc., Fresno, \$4,422.60; Clyde W. Wood, Stockton, \$6,786; Oilfields Trucking Co., Taft, \$5,311.80; Basalt Rock Co., Inc., Napa, \$7,768.80; Hartman Const. Co., Bakersfield, \$6,154.20; P. J. Akmadzich, Los Angeles, \$6,318; Square Oil Co., Inc., Los Angeles, \$6,130.80; F. W. Nighbert, Bakersfield, \$6,154.20. Contract awarded to Granite Const. Co., Ltd., Watsonville, \$4,141.80.

LASSEN COUNTY—Dist. II, Rt. 29. Furnishing and applying asphaltic road oil on State highway in Lassen County between Nevada State line and a point 2 miles W. of Milford. Tiffany, McReynolds, Tiffany, San Jose, \$6,462.40; Basalt Rock Co., Inc., Napa, \$5,908.48. Contract awarded to Skeels & Graham Co., Roseville, \$5,539.20.

LOS ANGELES COUNTY—Dist. VII, Route 60. Near Temescal Canyon, about 1 mile NW. of Santa Monica, construct groynes. J. W. Terrell, Sacramento, \$11,867.60; Dimmitt & Taylor, Los Angeles, \$14,175.60; Merritt, Chapman & Scott Corporation, San Pedro, \$12,598; Kemper Construction Co., Ltd., \$21,270; Lynch, Cannon Engineering Co., Los Angeles, \$10,750; Mitty Bros. Const. Co., Los Angeles, \$13,825. Contract awarded to R. R. Bishop, Long Beach, \$9,867.40.

MADERA COUNTY—Dist. VI, Rt. 32. Between Merced-Madera County line and Califa, about 15.5 miles of oil treating earth shoulders. Fred W. Nighbert, Bakersfield, \$6,708; A. Teichert & Son, Inc.,

Sacramento, \$6,127.50; Granite Construction Co., Ltd., Watsonville, \$4,923.50; John Jurkovich, Fresno, \$4,515. Contract awarded to Oilfields Trucking Co., Taft, \$3,848.50.

MARIPOSA COUNTY—Dist. VI, Rt. 18. Between Pain Flat and Mariposa, about 7.6 miles to be graded. Meyer Rosenberg, San Francisco, \$243,010.25; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$248,410.50; Mitty Brothers Const. Co., Los Angeles, \$240,863.35; MacDonald & Kahn Co., Ltd., San Francisco, \$228,673; Clyde W. Wood, Stockton, \$254,650.30; Contoules Const. Co., San Francisco, \$187,224.60; The Utah Const. Co., San Francisco, \$203,427.40; Gist & Bell, Arcadia, \$249,084.30; Nevada Contract Co., Fallon, Nevada, \$269,942.30; C. T. Malcom, Walnut Grove, \$297,673.30; Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$215,691.75; Morrison-Knudsen Co., Los Angeles, \$210,360.40; Kern & Kibbe, Portland, Ore., \$278,756.20; Herbert M. Baruch Corporation, Ltd., and Robinson-Roberts Co., \$322,871.90. Contract awarded to Chas. Harlowe, Jr., Oakland, \$185,062.15.

MENDOCINO COUNTY—Dist. I, Rt. 1. Furnishing and stockpiling crushed gravel or stone and screenings near Longvale, Mendocino County. Tieslay Bros., Berkeley, \$11,350; Smith Bros., Co., Eureka, \$11,100; Hemstreet & Bell Co., Marysville, \$12,750. Contract awarded to Basalt Rock Co., Inc., Napa, \$10,100.

MERCED, FRESNO, TULARE AND KERN COUNTIES—Dist. VI, Rt. 4. Furnishing and installing railroad crossing floodlights at various locations on State highway. Curtis Hess, Fresno, \$2,297.75; Elec. Service Shop, Visalia, \$1,600; Merced Hdwr. & Impl. Co., Merced, \$1,870; Robinson Elec. Co., Fresno, \$2,159. Contract awarded to Sam Fingerhut, Bakersfield, \$1,864.

MODOC COUNTY—Dist. II, Rt. 73. Furnishing and application of asphaltic road oil on portions of State highway in Modoc County, between the California-Oregon line near New Pine Creek and the junction of Routes 73 and 28 near Alturas. Tiffany, McReynolds, Tiffany, San Jose, \$7,919.10; Basalt Rock Co., Inc., Napa, \$7,818.54. Contract awarded to Skeels & Graham Co., Roseville, \$7,164.90.

MONO COUNTY—Dist. IX, Rt. 23. Between 2 miles west of Bridgeport and Sonora Junction, about 14.2 miles to be surf. with cr. run base and bituminous treated crushed gravel or stone. Southern California Roads Co., Los Angeles, \$114,846.50; Clark & Henery Construction Company, San Francisco, \$128,349; Hemstreet & Bell, Marysville, \$111,505; Tieslay Bros. and A. Mitchell, Sacramento, \$108,106.60; Granite Construction Company, Ltd., Watsonville, \$111,969; Southwest Paving Company, Los Angeles, \$103,762.90; Fred W. Nighbert, Bakersfield, \$125,570.50; A. Teichert & Son, Inc., Sacramento, \$104,129.20; Isbell Construction Co., Carson City, Nevada, \$129,913.20. Contract awarded to George Herz & Co., San Bernardino, \$85,854.50.

MONTEREY COUNTY—Dist. V, Rt. 56. Reinf. conc. bridge across Rocky Creek about 17 miles south of Carmel. One 239-foot open arch span and six gird. appr. sps. 258 feet long. Schuler & McDonald, Inc., Oakland, \$117,777; M. B. McGowan, Inc., San Francisco, \$72,852; Porter Bros. Corporation, San Francisco, \$80,714; J. W. Terrell, Sacramento, \$66,539.50; George J. Ulrich Construction Co., Modesto, \$67,861.30; F. C. Amoroso and Sons, San Francisco, \$67,951.50; Barrett & Hilp, San Francisco, \$69,006; Obara Bros., Los Angeles, \$79,604.50; Neves and Harp, Santa Clara, \$69,732.50; Rocca & Caletti, San Rafael, \$63,002. Contract awarded to Ward Engineering Company, San Francisco, \$62,165.50.

ORANGE COUNTY—Dist. VII, Rt. 60. Newport Beach to Corona del Mar, 4.8 miles to be paved with P. C. C. Sander Pearson, Santa Monica, \$115,841.80; George R. Curtis Paving Company, Los Angeles, \$117,008; L. A. Paving Co., Inc., Los Angeles, \$112,392.50; J. L. McLain, Los Angeles, \$106,284; United Concrete Pipe Corporation, Los Angeles, \$113,664.50; Kovacevich & Price, Inc., South Gate, \$104,698.50; Griffith Company, Los Angeles, \$105,581; Lee Moor Contracting Co., El Paso, Texas, \$105,300.50. Contract awarded to Jahn & Bressi Construction Co., Inc., Los Angeles, \$104,291.50.

Oiling Contracts Let in Many Counties

(Continued from preceding page)

PLACER AND EL DORADO COUNTIES—Dist. III, Rt. 65. About 35.8 miles to be treated with asphaltic road oil as a dust palliative. A. Teichert & Son, Sacramento, \$4,882.50; Oilfields Trucking Co., Taft, \$5,782.50; Tiffany, McReynolds, Tiffany, San Jose, \$4,680; C. W. Wood, Stockton, \$4,905; Basalt Rock Co., Inc., Napa, \$4,612.50; E. F. Hilliard, Sacramento, \$4,702.50; Force Construction Co., Piedmont, \$5,850; Skeels & Graham Co., Roseville, \$5,287.50. Contract awarded to C. F. Fredericksen & Sons, Lower Lake, \$4,477.50.

PLACER COUNTY—Dist. III, Rt. 3. Between Lincoln and Sheridan, about 6.7 miles to be gr. and surf. with bit. tr. cr. gr. or st. (plant mix). A. Teichert & Son, Inc., Sacramento, \$45,855; J. F. Johnston, Stockton, \$43,743; McGillivray Construction Co., Sacramento, \$45,860.90; C. W. Wood, Stockton, \$58,100.50; Larsen Bros., Galt, \$49,828; Southwest Paving Co., Inc., Los Angeles, \$48,377; L. G. Kipp, Sacramento, \$53,548; Clark & Henery Const. Co., San Francisco, \$46,918.50; United Contracting Co., Oakland, \$58,920; Fred W. Nighbert, Bakersfield, \$47,869; A. Mitchell, Sacramento, \$48,888.50; Lord & Bishop, Sacramento, \$47,126.50; Pacific States Const. Co., San Francisco, \$46,548.50. Contract awarded to Hemstreet & Bell, Marysville, \$39,172.

PLUMAS COUNTY—Dist. II, Rt. 21. Furnishing and applying asphaltic road oil on portions of State highway in Plumas County between Bucks Ranch and Quincy. Skeels & Graham Co., Roseville, \$5,332. Contract awarded to Basalt Rock Co., Inc., Napa, \$4,678.40.

RIVERSIDE COUNTY—Dist. VIII, Rt. 6.4. Between Blythe and Ehrenberg Bridge, about 3.7 miles to be graded and surfaced with oil treated crushed gravel or stone. Gist & Bell, Arcadia, \$139,338.50; H. W. Rohl Company, Los Angeles, \$159,187; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$178,091.70; George Herz & Co., San Bernardino, \$149,573.10; Basich Brothers, Torrance, \$136,004.80; V. R. Dennis Construction Co., San Diego, \$147,534; Southern California Roads Co., Los Angeles, \$153,945.80. Contract awarded to Lee Moor Contracting Co., El Paso, Texas, \$131,866.15.

RIVERSIDE COUNTY—Dist. VIII, Rt. 26. Between Ave. 62 and Ave. 74, about 8.3 miles to be graded and paved with P. C. George Herz & Co., and Kovacevich & Price, San Bernardino, \$283,793.20; Thomas C. Rogers, Los Angeles, \$349,976.50; Griffith Company, a corporation, Los Angeles, \$278,002.80; Imperial Rock Corporation and Orange Co. Rock Co., and Matich Bros., Anaheim, \$370,530.52; Jahn and Bressi Construction Co., Inc., and R. E. Hazard Contracting Co., Los Angeles, \$316,524; Southern California Roads Co., Los Angeles, \$321,569.40; United Concrete Pipe Corporation, Los Angeles, \$277,802.40. Contract awarded to Lee Moor Contracting Co., El Paso, Texas, \$257,301.30.

RIVERSIDE COUNTY—Dist. VIII, Rt. 26. Between Ave. 74 and S'ly boundary grade and pave with P. C. about six (6.0) miles. Lee Moor Contracting Co., El Paso, Texas, \$307,874.25; R. E. Hazard Cont. Co., San Diego, \$306,616.20; Griffith Company, Los Angeles, \$302,233.63. Contract awarded to United Concrete Pipe Corporation, Los Angeles, \$286,806.35.

SAN DIEGO COUNTY—Dist. VII, Rt. 12. Between Bostonia and Chocolate Creek, about 7.5 miles to be graded and paved with P. C. concrete. Fredrickson & Watson Const. Co., and Fredrickson Bros., Oakland, \$243,337.50; Sander Pearson, Santa Monica, \$249,735.50; Walter Trepte, San Diego, \$239,578.50; Sharp and Fellows Contr. Co., Los Angeles, \$248,037; V. R. Dennis Construction Co., San Diego, \$245,790; Daley Corporation, San Diego, \$249,885.15; Griffith Company, Los Angeles, \$231,861.75; L. E. Dixon Co., Los Angeles, \$236,452.50; Lee Moor Contr. Co., El Paso, Texas, \$242,198.50; Thomas C. Rogers, Los Angeles, \$273,251.50; United Concrete Pipe Corporation, Los Angeles, \$245,600. Contract awarded to Bodenhamer Construction Co., Oakland, \$219,535.25.

SANTA CLARA COUNTY—Dist. IV, Rt. 68. Across Stevens Creek, a rein. conc. gir. bridge: 1-30' span and 1-20'10" span on conc. bents and a conc. abut. with W.W's. The Utah Const. Co., San Francisco, \$21,767; John Doyle, San Jose, \$24,694; L. C. Seidel, Oakland,

\$20,418; Nelson Bros., Escalon, \$24,059; J. W. Terrell, Sacramento, \$21,808.75; J. P. Lawlor, San Francisco, \$22,461; Thermotite Const. Inc., San Jose, \$20,777; Force Const. Co., Piedmont, \$22,147.75; Whited & Whited, Santa Rosa, \$19,082.70; Lord and Bishop, Sacramento, \$21,890.25; George Ulrich Construction Co., Modesto, \$23,608.25; A. J. Raisch Co., San Jose, \$67,654; John E. Branagh, Piedmont, \$24,084.60; M. B. McGowan, Inc., San Francisco, \$20,678; Wm. E. Lyons, Oakland, \$22,910; Frederickson & Watson Co. and Frederickson Bros., Oakland, \$21,252; R. L. Oakley, Palo Alto, \$28,367.50; Seimer and Kendall, San Anselmo, \$25,917.50. Contract awarded to Neves & Harp, Santa Clara, \$18,461.37.

SANTA CRUZ COUNTY—Dist. V, Rt. 5. Between Inspiration Point and Vine Hill Road 5.1 miles to be cleared and grubbed. Meyer Rosenberg, San Francisco, \$64,940; A. Mitchell, Sacramento, \$45,050; Moore & Washburn, Santa Cruz, \$39,015; Guy F. Atkinson, San Francisco, \$44,540; J. E. Ely, Oroville, \$25,075. Contract awarded to Fred W. Nighbert, Bakersfield, \$15,980.

SHASTA COUNTY—Dist. II, Rt. 28. Between Hat Creek Summit and Fall River Mills, about 8.7 miles to be graded and surf. with cr. run base and bit. tr. cr. gr. or stone, plant mix. Hemstreet & Bell, Marysville, \$349,679; A. Teichert & Son, Inc., Sacramento, \$373,543.50; Von der Hellen & Pierson, Castaic, \$416,124.50; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$445,401.15; A. Guthrie & Co., Inc., Portland, Ore., \$365,280; Hartman Construction Co., Bakersfield, \$449,317.50; Nevada Contracting Co., Fallon, Nev., \$413,213; Dunn & Baker, Klamath Falls, \$406,983; Isbell Construction Co., Carson City, Nev., \$479,539.25; Clark & Henery Construction Co., San Francisco, \$412,982.50; Kern & Kibbe, Portland, Ore., \$333,142.75; Morrison-Kaudsen Co., Los Angeles, \$451,407.20; Clarence Young & C. T. Malcom, Walnut Creek, \$468,507.75; T. E. Connally, San Francisco, \$479,881.50. Contract awarded to F. C. Coats, Sacramento, \$331,551.

SISKIYOU COUNTY—Dist. II, Rt. 46. Furnish and apply asphaltic road oil on portions of State highway between Route 3 and Walker. Oilfields Trucking Co., Taft, \$1,938.80; Basalt Rock Co., Inc., Napa, \$2,371.10. Contract awarded to Skeels & Graham Co., Roseville, \$1,801.25.

SISKIYOU COUNTY—Dist. II, Rt. 72. Furnishing and application of fuel oil and asphaltic road oil on portions of State highway in Siskiyou County, between Weed and State line near Calor. Basalt Rock Co., Inc., Napa, \$9,412; Oilfields Trucking Co., Taft, \$10,687. Contract awarded to Skeels & Graham, Roseville, \$8,567.50.

SOLANO COUNTY—Dist. X, Rts. 7 and 8. Between one-half mile W. of Cordelia and one-third mile E. of Fairfield about 6.4 miles to be graded and paved with P. C. C. Hein Bros., Basalt Rock Co., and J. V. Galbraith, Petaluma, \$213,758.30; Frederickson & Watson Construction Co., Frederickson Bros., Oakland, \$195,823.90; C. W. Wood, Stockton, \$189,563.75; Union Paving Co., San Francisco, \$203,473.65; Heafey-Moore Co., Oakland, \$232,364.95; United Concrete Pipe Corporation, Los Angeles, \$209,837.85; Peninsula Paving Company, San Francisco, \$226,878.05; Hanrahan Company, San Francisco, \$195,124.25; Southern California Roads Co., Los Angeles, \$212,891.50. Contract awarded to D. McDonald and N. B. Ball, Sacramento, \$185,083.15.

SONOMA COUNTY—Dist. VI, Rt. 8. Furnish and place bituminous treated crushed gravel or stone surface between Fairville and Vineburg Junction, about 1 mile. Pacific States Construction Co., San Francisco, \$8,430; C. W. Wood, Stockton, \$8,320; A. Teichert & Son, Inc., Sacramento, \$7,542; H. A. Anderson, Sacramento, \$8,415; Helwig Construction Co., Sebastopol, \$7,430; J. V. Galbraith, Petaluma, \$8,375. Contract awarded to U. B. Lee, San Leandro, \$8,320.

SONOMA AND MARIN COUNTIES—Dist. IV, Rt. 1. Furnish and apply light fuel oil to earth shoulder each side of existing pavement between Windsor and Sausalito, about 51.7 miles. C. F. Fredericksen & Sons, Lower Lake, \$5,206; The A. Helwig Const. Co., Sebastopol, \$6,612; Tiffany McReynolds, Tiffany, San Jose, \$6,270; A. Teichert & Son, Inc., Sacramento, \$6,840; Basalt Rock Co., Inc., Napa, \$5,396; Oilfields

(Continued on page 38)

New California Institution for Women Near Tehachapi Dedicated by Governor

GOVERNOR JAMES ROLPH, Jr., dedicated the new building group of the California Institution for Women in Cummings Valley near Tehachapi in Kern County, at 2 p.m. on Sunday, May 22d. The Governor was assisted by State legislators and officials including Senator James I. Wagy of Bakersfield and Assemblywoman Eleanor Miller of Los Angeles; Daniel J. O'Brien, director of the Department of Penology; Colonel Walter E. Garrison, director of the Department of Public Works, and James I. Herz, deputy director; the Board of Trustees of the Institution, Mrs. Ernest Wallace of Alhambra, chairman, Judge T. N. Harvey of Bakersfield, vice chairman, and Miss Grace Barneberg of San Luis Obispo.

The Kern County Chamber of Commerce entertained Governor Rolph with a breakfast at the El Tejon Hotel at 10 a.m. and later a cavalcade of automobiles occupied by the Chamber of Commerce members and other distinguished citizens of Kern County escorted the gubernatorial party to the dedication ceremonies. Mr. Ernest Wallace, chairman of the Board of Trustees, acted as chairman of the day.

IMPRESSIVE PROGRAM

The program opened with an invocation by Rev. Alanzo W. Reynolds of the First Methodist Episcopal Church of Bakersfield. Assemblywoman Eleanor Miller, introduced by Senator Wagy, told how the legislation creating the institution was formulated. Director O'Brien introduced Governor Rolph who delivered the dedication address and performed the dedicatory ceremonies. Monseigneur Philip G. Seher, Vicar General, Diocese of Monterey-Fresno, closed the impressive exercises with the benediction. Music was furnished by the Kern County Union Highway School Band.

The new institution is situated on a tract of 1682 acres in Cummings Valley about 9 miles north of the town of Tehachapi in the southern part of Kern County, at an elevation of about 4000 feet. The cost of the site was about \$100,000.

It is intended that the new institution shall be opened in July next, the women now

detained at the State Prison at San Quentin to be transferred from there thus releasing the present Women's Building at San Quentin for use as a hospital for males.

FOUR BUILDINGS

The four new buildings to be dedicated are of reinforced concrete in Norman style erected at a cost of \$450,000, and consisting of an Administration Building, a Detention Building and two cottages. The Administration Building besides the administrative offices provides quarters for the superintendent, employees, dining rooms and kitchen; hospital unit with observation rooms and a chapel. The Detention Building provides for about 80 inmates in two separated groups of about 40 each, and each of the two cottages provides for about 40 inmates. The capacity of the institution at the outset therefore will be for about 170 inmates. The master plan for ultimate development is laid out to admit future additional buildings as required.

Temporary buildings only will be provided at the present time for poultry, dairy and hogs.

The opening of this new institution has a very special significance since it is California's recognition after many years of preliminary work on the part of the devoted women of the State of the thoroughly established fact that female law violators should not be detained in the same institution with male violators.

MUCH MORE ROOM

Whereas the women prisoners now confined at San Quentin are required to develop all the activities of their lives on an area of less than two acres of ground which includes the building in which they are housed and the entire open space available for outdoor activities, at the new institution in Cummings Valley there will be available to them as already stated an area of 1682 acres so that all the activities both in and out of doors in which they can be advantageously engaged can be provided.

It is confidently expected that the proportion of women committed to the institution whose rehabilitation will justify their return to society with safety to society and to them-

(Continued on page 40)



ART AND HEART went hand in hand in planning this group of buildings for the California Institution for Women, located in Cummings Valley near Tehachapi, Kern County. Housed in these spacious, well equipped structures of Norman architectural design, women heretofore crowded in San Quentin will be rehabilitated for their return to society. The large Dentention Building and two dormitory cottages are at the left of the group with the Administration Building at right. This air-view was taken by the 115th Photo Section, Fortieth Division Aviation, California National Guard, Griffith Park, Los Angeles.

State Highway Link Gives View of Akron

(Continued from page 2)

in their endeavor to secure the Sunnyvale dirigible site for California.

VISITORS INVITED

Concluding the dedication Admiral Cole stated it was desirable to have all civilians enter the air base and view the great ship, as it was the pride of the American people and they should have every opportunity to see the benefits of the Navy's activities in aeronautics.

The total expenditure in this Sunnyvale link has been approximately \$48,000. This amount, added to the total spent to date in constructing the Bayshore Highway between San Francisco and San Jose, approximates a total of \$4,000,000. In addition to this sum there is now being expended an additional \$636,000 to extend grading and paving of this important arterial highway from Redwood City to Palo Alto.

The Division of Highways will also contract, during the early summer, for further grading and paving of an additional unit of the Bayshore Highway from Palo Alto to the Lawrence Station Road in Santa Clara County.

Architect McDougall Making a Study Tour

GEORGE B. McDOUGALL, A.L.A., Chief of the Division of Architecture of the Department of Public Works has been sent East to make a study of the largest penal institutions and hospitals for the insane in the country.

Mr. McDougall's trip comes as the result of the recent selection of a site near Camarillo, Ventura County, that will ultimately be expanded into the largest hospital for the insane in the State with a capacity for 5000 patients. Governor Rolph, Dr. J. M. Toner, Director of Institutions, and Colonel Walter E. Garrison, Director of Public Works, decided that such a trip was necessary to secure the latest ideas for the design and construction of such a building and Daniel J. O'Brien, Director of Penology, urged that the itinerary be extended to take in prisons for ideas to be incorporated in the prison for first offenders to be built in the South.

Accordingly, the State Architect will visit twenty-one institutions in eleven cities and eight states, including New York, Boston, Chicago, Washington, D. C.; Alderson, West Virginia; Stillwater, Minnesota, and Tacoma, Washington.

Six Bridges on Major Project List

(Continued from page 16)

California and the northwest, will, when completed, replace the light 80-foot steel truss with its 21-foot roadway which was built some 16 years ago by the county and will provide traffic with a modern crossing at this point.

SIX NEW BRIDGES

The six bridges included in the projects proposed for advertising during May include the following major structures:

Where the Coast Route of the State highway system crosses the Ventura River at the northerly city limits of Ventura, the Division of Highways plans the construction of a new bridge. The new structure will be at the same location as the existing 1160-foot concrete deck arch and deck girder bridge, with its 20-foot roadway, which was built by the county in 1912. The proposed bridge will be of the reinforced concrete girder type and will consist of 19 spans having a total length of 1233 feet; the roadway will be 44 feet wide with two sidewalks.

This modern structure, as an improvement to the heavily traveled arterial connecting Los Angeles and San Francisco, will tie in with the reconstruction of the route through the city of Ventura. It is planned to start the street work later this year as a cooperative project financed by the city of Ventura, the State and Ventura County.

This street improvement will follow Main, Garden and Meta streets. The State is to pay for a 30-foot width of pavement and a proportional part of the cost of grading and drainage structures while the city and county will bear the remaining cost of constructing the streets 56 and 76 feet between curbs. The citizens of Ventura voted \$100,000 in bonds this past winter for the project. The street improvement in Ventura together with the new bridge across the river will relieve one of the most congested traffic conditions in this section of the State.

BEAUTIFUL STRUCTURE

Further improvement to the scenic San Simeon-Carmel Highway, which skirts the rugged bluffs along the shore of the Pacific in Monterey and San Luis Obispo counties, will be made by the construction of a bridge across Wild Cat Creek at "The Highlands," a few miles south of Carmel. This new reinforced concrete structure, while only 164 feet in length, will be a beautiful bridge composed of three arch spans faced with stone native to this scenic coast country. The graceful line and symmetry of these stone arches will give a pleasing effect in the rugged and rocky setting. The bridge will provide a clear roadway 34 feet wide with two 4-foot side walks and will replace the existing narrow timber trestle.

In San Joaquin County the old three-span steel truss bridge across Paradise Cut between Tracy and Stockton, on the Oakland-Stockton lateral will be replaced by a modern structure composed of 10 steel stringer spans on reinforced concrete piles. The new bridge will be 440 feet long and will provide a 34-foot roadway, as against the 18-foot roadway on the existing 24-year-old structure. The alignment upon which the proposed bridge is to be placed coincides with the alignment of the pavement which was recently constructed between Banta and Mossdale.

WIDENING OPERATION

At the county line between Stanislaus and San Joaquin counties the State highway bridge across the Stanislaus River at Ripon, on the Los Angeles-Sacramento arterial, is to be reconstructed. The reconstruction includes the widening of the two 103-foot arch spans and replacing the timber approach spans with 23 reinforced concrete and steel girder spans, each 44 feet long, giving a total length of 1218 feet for the new structure. The new roadway width will be 24 feet.

Another unit in the reconstruction of the southern end of the main highway between Los Angeles and San Diego will be the construction by the State of the overhead crossing over the tracks of the Atchison, Topeka and Santa Fe Railway in Sorrento Canyon, just north of the city limits of San Diego.

This overhead structure will consist of 13 reinforced concrete spans with a total length of 553 feet. It will provide a clear roadway width of 44 feet. This structure is located on the new alignment of the highway between Sorrento Creek and Del Mar which is now being constructed by the State and is a part of the general reconstruction of this entrance into San Diego which is being brought to completion by several projects under a general cooperative agreement between the State and the city of San Diego.

Projects involved in this reconstruction include the Rose Canyon Cut-off which was completed over a year ago, the reconstruction of the famous Torrey Pines grade and the placing of a one-way highway paralleling the existing road from the top of the grade to the northerly end of the Rose Canyon road and paving from the southerly end of the Rose Canyon road to Atlantic Street; also the construction of a bridge across the San Diego River and another, which is now under construction, across Sorrento Creek. This last structure is located about a quarter of a mile south of the proposed Sorrento Canyon overhead.

APRIL ARCHITECTURAL AWARDS

Stockton State Hospital—Contract for general work on kitchen and bakery building, to Guth and Fox, Sacramento, \$85,514; for electrical work to Eddy Electric Company, Stockton, \$4,035; for plumbing and heating to Jos. C. Black, Stockton, \$25,200.

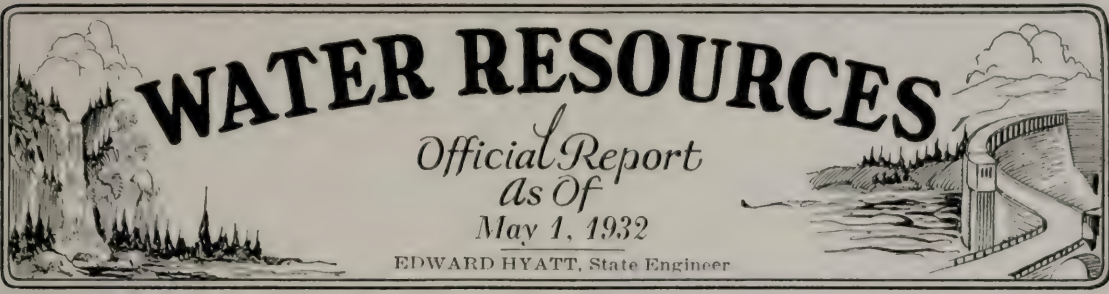
Industrial Home for Adult Blind, Berkeley—Contract for general work on superintendent's residence, to Gaubert Bros., \$8,385; for heating work to Pacific Heating & Ventilating Co., \$1,050; for plumbing work to Carl T. Doell, Oakland, \$1,492; for electrical work to Geo. Woolf, \$657.

Sonoma State Home, Eldridge—Contract for water tube boiler and accessories to California Steel Products Co., \$9,987.

Folsom State Prison—Contract for water tube boiler and accessories, to California Steel Products Co., \$9,137.

"Under the spreading chestnut tree
The smith works like the deuce,
For now he's selling gasoline,
Hot dogs, and orange juice."

"You say Mr. Peck is very patient with his wife?"
"Didn't I just tell you that he explained the principle of free wheeling to her?"—*Borrow Pit.*



WATER RESOURCES

*Official Report
as Of
May 1, 1932*

EDWARD HYATT, State Engineer

Due to the assurance generally of an ample water supply for the season, irrigation projects are in a somewhat more hopeful position than they were a year ago, but because of the difficulty and sometimes impossibility of many landowners financing crop production during the current season there is likely to be a considerable decrease in the acreage under cultivation. This is particularly noticeable in rice planting, and to a lesser extent in most other field crops, says the report of State Engineer Hyatt for April.

Details of irrigation projects, the outlook for summer stream flow, results of water basin investigations, flood control and dam projects are among the other activities of the Division of Water Resources covered in the report as follows:

In connection with obtaining information necessary to the State Engineer's office or required by the Districts Securities Commission, the following districts were visited: Anderson-Cottonwood irrigation district, Shasta County; El Camino and Deer Creek irrigation districts, Tehama County; Princeton-Codora-Glenn and Glenn-Colusa irrigation districts, Glenn County; Richvale irrigation district, Butte County; West Side irrigation district, San Joaquin County; East Contra Costa and Byron-Bethany irrigation districts, Contra Costa County.

DISTRICTS SECURITIES COMMISSION

On March 22, Commissioners Rainey, Vogel and Hyatt and Secretary Bonte, met at Merced with the directors and an executive committee of Merced irrigation district landowners for the consideration of district affairs, especially with reference to financial matters.

A regular meeting of the Districts Securities Commission was held at San Francisco on April 8, at which reports on Terra Bella, Anderson-Cottonwood, West Side, Paradise and Oroville-Wyandotte irrigation districts were given consideration.

DAMS

To date 802 applications have been received for approval of dams built prior to August 14, 1929; 93 for approval of plans for construction or enlargements and 255 for approval of plans for repairs or alterations.

Applications Received for Approval of Plans for Repair or Alteration.

Dam	Owner	County
Harold	Littlercock and Palmdale Ir. Dist.	San Diego
Willow Hill	Natomas Company	Sacramento
Daly	Geo. Kyburz	Sacramento
Veterans' Home	State Veterans' Home	Napa
Detert Lake	Detert Estate	Lake
Ridenour	Ridenour Estate	Lassen

Plans Approved for Construction or Enlargement.

Dam	Owner	County
Antioch	Town of Antioch	Contra Costa
Irvine Conservation	The Irvine Company	Orange

Plans Approved for Repairs or Alterations.

Fourteen of such applications were approved during the period.

Routine inspections of dams reveal that many reservoirs are full, which fact permits the department to make observations of these structures under loading. This has not been possible for several years in a great many cases.

Office studies are nearing completion on old dams and certificates of approval will be issued shortly on those structures which meet the requirements; while orders will be issued on those dams which require repairs or alterations to place them in satisfactory condition.

Most of the alterations consist in enlargement of spillways to handle the excess waters expected in times of flood. Since the new law governing the supervision of dams went into effect on August 14, 1929, more than a third of the existing structures have been voluntarily repaired in accordance with suggestions of this office.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The maintenance headquarters near Sutter City has been completed and the work of transferring material and equipment is well under way and will be completed within the next month.

Flashboards have been placed in weirs Nos. 2, 3 and 4 and the water raised to full height, which is made necessary on account of the recent lack of rain. The regular annual repair to the earth dam in Gilsizer Slough is now being made so that water may be held in the east borrow pit between weir No. 2 and Willow Slough for the irrigation of the Willow levee protection.

The banks of the East Intercepting Canal have been reinforced to prevent caving at the crossing of the Sutter-Butte Canal Company flume.

240 Projects Listed for Inspection

(Continued from page 31)

Emergency Flood Protection and Rectification of Rivers.

In cooperation with Riverside County and landowners, rectification work on Bautista Wash, a tributary of the San Jacinto River, has been completed at a cost of \$1,500.

Bank protection work on the left bank of the San Joaquin River between the Mossdale Bridge and the Banta Carbona intake, in cooperation with a group of landowners, has been completed at a cost of \$5,000. This work consisted of repairing and securing tree protection installed two years ago, and the construction of tree and brush protection at two other points, protecting about 600 feet of river bank. The larger section of about 400 feet consists of a log toe dam secured in place by 34 screw anchors with a levee facing of logs and brush.

Sacramento Flood Control Project—Bank Protection.

No work of this class is under way at the present time. An examination has been made of the conditions of the banks on the Sacramento River above the Butte City bridge in connection with possible future work.

Navarro River.

Approximately 200 tons additional rock have been placed on the jetty at the mouth of the Russian River. This completes the maintenance work contemplated for this fiscal year.

Russian River Jetty.

Work was discontinued on the jetty at Jenner on April 6th, as it was considered that the steel trestle and the other portions of the structure were made sufficiently secure, so that further work can be safely deferred until good weather. It is proposed to commence work in the quarry on about May 10th, and to start placing rock in the jetty about June 1st.

Flood Measurements and Gages.

On account of the lack of flood stages in the various channels of the Sacramento and San Joaquin Valley, no discharge measurements have been made. The routine work of maintaining the continuous water stage gages has been continued and the compilation of records has continued in the office.

WATER RIGHTS

Applications to Appropriate.

Twenty-six applications to appropriate were received during the month of March, 7 were denied and 11 were approved, 1 permit was revoked and 35 licenses were issued.

The field season in connection with inspection of projects covered by permits and licenses began on April 4th and it is estimated will continue until November 1st. Some 240 projects are listed for inspection and the work will take engineers of the Division into all counties of the State.

ADJUDICATIONS

North Cow Creek (Shasta County)—A decree defining the water rights on North Cow Creek, based upon the amended stipulation for judgment heretofore signed by all parties, has been prepared by the Division upon request of the Superior Court of Shasta County, and is being circulated among counsel.

Clover Creek (Shasta County)—Action on the case in the Superior Court of Shasta County is pending the outcome of negotiations for settlement by stipulation.

Deep Creek (Modoc County)—A schedule of allotments for trial distribution during the 1932 irrigation season was adopted by the water users at a meeting held on March 15, 1932 at Cedarville.

Franklin Creek (Modoc County)—At a conference held at Alturas on March 14, 1932, the water users agreed to a plan of distribution for the 1932 season.

New Pine Creek (Modoc County)—The stipulation for judgment submitted to the water users at a conference held at New Pine Creek on March 16, 1932, was signed by 80 per cent of the parties at interest, and is now being circulated among the remaining parties.

Eagle Creek (Modoc County)—The plan for trial distribution of the waters of the stream for the 1932 irrigation season, submitted to the water users at a conference held at Eagleville on March 15, 1932, was adopted.

South Fork Pit River (Modoc County)—Field work on the South Fork Pit River Reference was commenced April 1. A plan for the distribution of the waters of the stream during the 1932 season was adopted by the water users at a meeting held April 12, and distribution under the plan was started on April 15.

Pine Creek (Modoc County)—Adjudication by Agreement of the water rights on Pine Creek was discussed with the water users on that stream at a meeting held April 13. The water users were agreeable to such an adjudication, but desired that a plan of distribution be tried out during the 1932 season before effecting a final settlement. An agreement covering such a plan of distribution is being circulated among the water users for signature.

WATER DISTRIBUTION

Cedar, Davis, Deep, Emerson, Franklin, Mill, New Pine, Owl and Soldier creeks and South Fork of Pit River (Modoc County)—Water master service on these streams for the 1932 season was commenced on the dates as follows:

Soldier Creek—March 19.

Deep Creek—March 20.

Cedar, Davis, Emerson, Franklin, New Pine and Owl creeks—April 1.

South Fork Pit River—April 15.

Forecasts of Stream Flow Published

(Continued from preceding page)

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Office work in compilation of the annual report presenting all 1931 data on the diversions, stream flow, return flow, use of water, salinity, etc., for the Sacramento-San Joaquin territory has continued during the past month and is nearing completion. Work on the special report of damage in 1931 due to salinity and water shortage is also nearing completion.

Sampling at 19 permanent salinity stations in the Upper Bay and Delta region and operation of tide gages has been maintained. Tests of samples taken on April 10th were as follows:

SALINITY—UPPER BAY AND SACRAMENTO-SAN JOAQUIN DELTA

Salinity in parts of chlorine
(ppm)
100,000 parts of water

Point Orient.....	1240*
Point Davis.....	420
Pullshood.....	130
Bay Point.....	26*
O. and A. Ferry.....	1**
Collinsville.....	1
Antioch.....	1
Jersey.....	3
Central Landing.....	3
Middle River P. O.....	6

* April 14th

** April 6th

Irrigation has begun on many of the projects in the Sacramento Valley and the field work in checking and measuring all diversions, return flow, etc., was started on April 1st. From present indications the rice area in the Sacramento Valley will be considerably less than that of last year. The outlook for summer stream flow is somewhat disappointing from the standpoint of the earlier heavy snows and precipitation. Present estimates based upon all available precipitation and snow data place the seasonal run-off (October to September, inclusive) in per cent of a 40-year normal at 65 per cent for the Sacramento River at Red Bluff, 75 per cent for the Feather River at Oroville and 90 per cent for the Yuba River and American River at Smartsville and Fair Oaks, respectively.

MINIMUM STREAM FLOWS

The combined run-off for Sacramento River and tributaries is estimated at 75 per cent and the combined percentage for the entire Sacramento-San Joaquin area is estimated at 90 per cent. Under these conditions minimum 1932 stream flows are estimated at follows: Sacramento River at Red Bluff 2700 second-feet; at Colusa 1800 second-feet; at Sacramento 2300 second-feet; Feather River at Nicolaus 500 second-feet; American River at Sacramento 210 second-feet; San Joaquin River near Vernalis 1500 second-feet; minimum combined flow of Sacramento and San Joaquin rivers to the Delta, 3900 second-feet. With these conditions, maximum salinity at Delta stations in 1932 is estimated at 650 parts of chlorine per 100,000 at O. and A. Ferry, 450 at

Collinsville, 330 at Antioch, 150 at Emmaton, 90 at Jersey, and 50 at Rio Vista.

The most important snow surveys as respecting predictions for spring and summer water supply were completed at the end of March and the monthly bulletin of snow survey and precipitation data, including also the seasonal forecast, was mailed early in April. The end of March surveys covered all of the snow courses throughout the Sierra and the data obtained furnished the basis for the forecasts of stream flow as published in the bulletin.

IRRIGATION—FEDERAL COOPERATION

In connection with the Federal-State cooperation for irrigation investigations, an inspection trip was made in the week of March 14 to 19 to review the progress of investigations in the Santa Ana, Mojave, and Ventura areas. Present field and office work on these projects is directed to a determination of the penetration of rainfall and to the consumptive use of water by various irrigated and nonirrigated crops, by brush cover, and by noneconomic aquatic growths. Special studies include the losses by evaporation and transpiration from moist and seeped areas and along stream channels. The heavy rains of the past winter have offered a fine opportunity to complete the penetration of rainfall studies.

WATER RESOURCES

South Coastal Basin Investigation—Investigational work has been continued in a normal way in this area. The major portion of the material for a bulletin on water levels in the South Coastal Basin area has been assembled and placed in the hands of the State Printer.

Mojave River Investigation—The discharge of the Mojave for the first time in several years was large enough to cause flow into the desert sinks where the water is disposed of. Water levels have risen near the stream. The data secured this year in this as in other investigations give a basis for more definite conclusions than any heretofore gathered in the course of the investigation.

Ventura County Investigation—Water levels have risen in this area and the investigation is proceeding along normal lines.

Salinas Valley Investigation—As in the Ventura County area, water levels have risen in this area and the investigation is being continued along normal lines.

Pit River Investigation (Modoc and Lassen counties)—Work has been continued during the present month on the report covering the three years investigation of the Pit River.

Santa Clara Investigation—During the month of March levels were taken in all wells of the Santa Clara Valley which are under investigation in connection with this study. The generous precipitation of December, January and early February has caused several of the streams to flow throughout the month, a

(Continued on page 40)

Napa Bridge Formally Dedicated With Impressive Ceremonial Program

THE new \$65,000 "G. M. Francis Bridge," spanning the Napa River in the city of Napa, was formally dedicated to highway traffic Saturday, May 14th, with colorful ceremonies and entertainments.

The dedication program and celebration features were arranged by a committee headed by Eugene Webber, President of the Napa Chamber of Commerce, Supervisor Thomas Maxwell, Chairman of the Board of Supervisors of Napa County and Vice President of the Redwood Empire Association, and Mayor Frank W. Alexander of Napa, together with the members of the city council and Charles Grady, Secretary of the Napa Chamber of Commerce.

It was a memorable occasion with high Federal, State, county and city officials in attendance from various parts of Northern California including State highway officials and engineers, county supervisors and other county officers, mayors and city councilmen, Chambers of Commerce leaders, newspaper publishers and a host of other principals.

Representing the State were Colonel Walter E. Garrison, Director of Public Works; Earl Lee Kelly, chairman of the California Highway Commission; Rolland A. Vandegrift, Director of Finance, and Timothy A. Reardon, Highway Commissioner.

LUNCHEON FOR GUESTS

At noon a delightful luncheon was tendered the visitors by the Napa Chamber of Commerce in the Chamber's headquarters, where numerous principals present were introduced with brief remarks from some of them.

After luncheon a parade headed by the Boy Scouts' Band of Vallejo led the guests to the new G. M. Francis Bridge where the dedication exercises commenced with the national anthem led by D. G. Davis, and Supervisor Thomas Maxwell, as master of ceremonies conducted the following program after a word of welcome by Mayor Alexander and brief greetings by Harry Lutgens, President, Redwood Empire Association:

PROGRAM OF EXERCISES

Address—Rolland A. Vandegrift, Director of Finance, State of California.

Address—Timothy A. Reardon, Highway Commissioner from San Francisco.

Address—Colonel Walter Garrison, Director of Public Works, State of California.

Greetings by Senator Herbert W. Slater of Sonoma County.

Address—Earl Lee Kelly, Chairman, California Highway Commission, representing Governor James Rolph, Jr.

Presentation of giant redwood plaque, designating Napa as "Southeastern Gateway to Redwood Empire," by L. J. Peterson, President of Redwood Empire Chambers of Commerce Unit.

Address—Honorable Frank L. Coombs in tribute to the memory of G. M. Francis.

The christening ceremony was performed by Miss Matilda Allison and the ribbon barricade was cut by Miss Iris Harrold, daughter of City Engineer H. A. Harrold.

The bridge was formally named in honor of the late George M. Francis, dean of California publishers, former President of California Press Association and for many years publisher of the Napa Register.

One of the most beautiful phases of the program was the tribute to the memory of G. M. Francis, presented by Honorable Frank L. Coombs, and the christening of the bridge immediately thereafter by Miss Matilda Allison of Napa, Area President, American Legion Auxiliary.

FESTIVITIES CONTINUED

Other State officials in attendance included: Hugh McKeivitt, Attorney for the California Highway Commission; John W. Howe, Secretary of the Commission; F. W. Panhorst, Acting Bridge Engineer; Mrs. Dr. Joseph M. Toner, representing Dr. Toner, Director of Institutions, who is in the east; T. E. Ferneau, Associate Bridge Construction Engineer, who was the resident engineer on the job, and others.

After the ceremonies, a band concert was held on the courthouse steps by the Lincoln School Band and Vallejo Boy Scouts' Band, and at 7.30 p.m. a spectacular night parade was staged under the direction of Sheriff J. P. Steckter of Napa as grand marshal. A ball at which the grand march was led by Mayor Alexander closed the day's festivities.



Giant sand-etched redwood plaque presented to the City of Napa by the Redwood Empire Association during the bridge dedication. This plaque is to be superimposed upon 8-foot cross section of giant redwood tree as marker for Napa, Southeastern Gateway to the Redwood Empire. Left to right: Harry Lutgens, President, Redwood Empire Association; Mayor Frank W. Alexander of Napa, who accepted the plaque; L. J. Peterson of Petaluma, President, Redwood Empire Chambers of Commerce Unit, who presented the plaque; Earl Lee Kelly, Chairman, California Highway Commission, and Supervisor Thomas Maxwell, Chairman of the Board of Supervisors of Napa County.

THEY COME IN ALL SHADES, MAN

"Hullo, Brown, painting the car again?"

"Yes, the wife's been making innuendoes about a spring coat she says exactly matches the color of the car."—*Passing Show.*

Cop: "Say, young fellow, there's no parking here; you can't loaf along this road!"

Voice Within Car: "Who's loafin'?"

—*Mississippi Highways.*

VOYAGE OF DISCOVERY

Employer: "Can you operate a typewriter?"

Steno: "Yes, sir, I use the Biblical system."

Employer: "I never heard of it."

Steno: "Seek and ye shall find."

—*No. Dakota Bulletin.*

"Fill her up," said the absent-minded motorist to the waiter, as he parked himself in the restaurant with his sweetie.—*Lamplighter.*

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources during the month of April, 1932.

SAN DIEGO COUNTY—Corte Madera Dam No. 837. Corte Madera Corp., San Diego, owner; earth and rock, 14 feet above streambed with a storage capacity of 50 acre-feet, situated on Corte Madera Valley tributary to Pine Creek in Sec. 16, T. 16 S., R. 4 E., S. E. B. and M., for storage purposes for irrigation use.

CALAVERAS COUNTY—Maskus Dam No. 497. Fred Maskus, Ripon, owner; earth, 20 feet above streambed with a storage capacity of 25 acre-feet, located in Sec. 2, T. 4 N., R. 10 E., M. D. B. and M., for storage purposes for stock watering use.

TUOLUMNE COUNTY—Smith Dam No. 552. Smith Ditch and Mining Company, Jamestown, owner; rock, 30 feet above streambed with a storage capacity of 1½ acre-feet, situated on Woods Creek tributary to Tuolumne River in Sec. 1, T. 1 N., R. 14 E., M. D. B. and M., for diversion purposes for domestic, irrigation and mining use.

CALAVERAS COUNTY—Copperopolis Reservoir No. 498. Calaveras Consolidated Mining Company, Ltd., San Francisco, owner; concrete wall and earth, 27½ feet above streambed with a storage capacity of 225 acre-feet, situated on Penney Creek tributary to Stanislaus River in Sec. 33, T. 2 N., R. 12 E., M. D. B. and M., for storage purposes for domestic and milling use.

CALAVERAS COUNTY—Copperopolis Tailings Dam No. 498-2. Calaveras Consolidated Mining Company, San Francisco, owner; earth, 28 feet above streambed with a storage capacity of 6 acre-feet, situated on Copperopolis Creek tributary to Stanislaus, located in Sec. 2, T. 1 N., R. 12 E., M. D. B. and M., for storage of tailings.

LOS ANGELES COUNTY—Johnston's Lake Dam No. 19-2. City of Pasadena, Pasadena, owner; earth, 9 feet above streambed with a storage capacity of 32 acre-feet, situated on a draw tributary to Arroyo Seco, located on Burleigh Drive., for storage purposes for recreation use.

LASSEN COUNTY—Round Valley Dam No. 228. Rees T. Jenkins Land and Livestock Co., Johnstonville, owner; earth and rock, 35 feet above streambed with a storage capacity of 2000 acre-feet, situated on Round Valley Creek tributary to Willow Creek in Sec. 30, T. 31 N., R. 12 E., M. D. B. and M., for storage purposes for irrigation and stock use.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of public Works, Division of Water Resources, during the month of April, 1932.

SACRAMENTO COUNTY—Willow Hill Reservoir No. 453-2. Natomas Water Company, Sacramento, owner; earth, located in Sec. 12, T. 9 N., R. 7 E., M. D. B. and M.

SACRAMENTO COUNTY—Daily Dam No. 452. G. O. and Jennie Kyburz, Folsom, owner; earth, situated on a draw tributary to Alder Creek in Sec. 21, T. 9 N., R. 8 E., M. D. B. and M.

NAPA COUNTY—Veterans' Home Dam No. 1-14. Veterans' Home, Napa, owner; earth, situated on Overhold Creek tributary to Napa River.

LAKE COUNTY—Detert Lake Dam No. 392. Richard Detert, Mills Tower, owner; earth, situated on Bucksnot Creek tributary to Putah Creek in Sec. 9, T. 10 N., R. 6 W., M. D. B. and M.

LASSEN COUNTY—Ridenour Dam No. 259. S. D. Ridenour, Susanville, owner; earth, situated on unnamed drainage tributary to Susan River in Sec. 17, T. 29 N., R. 12 E., M. D. B. and M.

SOLANO COUNTY—Suisun Dam No. 21. Town of Suisun, Suisun, owner; earth, situated on unnamed creek tributary to Suisun Valley Creek in Sec. 12, T. 5 N., R. 3 W., M. D. B. and M.

NEVADA COUNTY—Pine Grove Dam No. 312-2. San Juan Ridge Mutual Water Association, Marysville, owner; earth, situated on unnamed creek tributary to South Yuba River in Sec. 19, T. 17 N., R. 8 E., M. D. B. and M.

SAN MATEO COUNTY—Filoli Dam No. 617. Filoli Inc., San Mateo, owner; earth, situated on branch of Laguna Creek tributary to San Mateo Creek in Sec. 30, T. 5 S., R. 4 W., M. D. B. and M.

AMADOR COUNTY—Bear River Dam No. 97-61. Pacific Gas and Electric Company, San Francisco, owner; rock, situated on Bear River tributary to North Fork Mokelumne in Sec. 9, T. 8 N., R. 16 E., M. D. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of April, 1932.

SANTA BARBARA COUNTY—La Patera Dam No. 751. The Sherman P. Stow Company, Santa Barbara, owner; earth, 14.7 feet above streambed with a storage capacity of 162 acre feet, located in Sec. 7, T. 4 N., R. 28 W., S. B. B. and M., for storage purposes for irrigation use.

LOS ANGELES COUNTY—Patrick Reservoir No. 778-4. Santa Catalina Island Company, Avalon, owner; earth, 46 feet above streambed with a storage capacity of 61½ acre-feet, situated on a small creek tributary to Grand Canyon in Sec. 32, T. 9 S., R. 14 W., S. B. B. and M., for storage purposes for domestic use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of April, 1932.

SAN DIEGO COUNTY—Harold Dam No. 57-2. Palmdale Irrigation District, Palmdale, owner; earth, located in Sec. 3, T. 5 N., R. 12 W., S. B. B. and M.

AMADOR COUNTY—Henderson Dam No. 1-10. Preston School of Industry, Waterman, owner; earth, situated on Middle Fork of Mule Creek tributary to Sutter Creek in Sec. 9, T. 6 N., R. 10 E., M. D. B. and M.

SAN DIEGO COUNTY—L. Helix Dam No. 56-4. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, located in Sec. 21, T. 16 S., R. 1 W., S. B. B. and M.

SACRAMENTO COUNTY—Willow Hill Dam No. 453-2. Natomas Water Company, Sacramento, owner; earth, located in Sec. 12, T. 9 N., R. 7 E., M. D. B. and M.

SACRAMENTO COUNTY—Daley Dam No. 452. G. O. and Jennie A. Kyburz, Folsom, owner; earth, situated on a draw tributary to Alder Creek in Sec. 21, T. 9 N., R. 8 E., M. D. B. and M.

NAPA COUNTY—Veterans' Home Dam No. 1-14. Veterans' Home, Napa, owner; earth, situated on Overhold Creek tributary to Napa River.

LASSEN COUNTY—Ridenour Dam No. 259. S. D. Ridenour, Susanville, owner; earth, situated on unnamed drainage tributary to Susan River in Sec. 17, T. 29 N., R. 12 E., M. D. B. and M.

SOLANO COUNTY—Suisun Dam No. 21. Town of Suisun City, Suisun, owner; earth, situated on unnamed creek tributary to Suisun Valley Creek in Sec. 12, T. 5 N., R. 3 W., M. D. B. and M.

LAKE COUNTY—Detert Lake Dam No. 392. Richard Detert, San Francisco, owner; earth, situated on Bucksnot Creek tributary to Putah Creek in Sec. 9, T. 10 N., R. 6 W., M. D. B. and M.

NEVADA COUNTY—Pine Grove Dam No. 312-2. San Juan Ridge Mutual Water Assn., Marysville, owner; earth, situated on unnamed creek tributary to South Yuba River in Sec. 19, T. 17 N., R. 8 E., M. D. B. and M.

SAN MATEO COUNTY—Filoli Dam No. 617. Filoli, Inc., San Mateo, owner; earth, situated on branch of Laguna Creek tributary to San Mateo Creek in Sec. 30, T. 5 S., R. 4 W., M. D. B. and M.

AMADOR COUNTY—Bear River Dam No. 97-61. Pacific Gas and Electric Company, San Francisco, owner; rock, situated on Bear River tributary to North Fork Mokelumne River in Sec. 9, T. 8 N., R. 16 E., M. D. B. and M.

April Water Applications and Permits

Applications for permits to appropriate water filed with the State Department of Public Works, Division of Water Resources, during the month of April, 1932.

SAN DIEGO COUNTY—Application 7223. Andrew O. Lyall and H. N. Nelson, c/o A. O. Lyall, 1906 E. State St., Long Beach, for 1,875 c.f.s. from Pauma Creek tributary to San Luis Rey River to be diverted in Sec. 9, T. 10 S., R. 1 W., M. D. B. and M., for irrigation and domestic purposes (40 acres).

MENDOCINO COUNTY—Application 7224. Autie M. Barnes, Dos Rios, for 0.087 c.f.s. from 2 springs tributary to Eel River to be diverted in Sec. 36, T. 22 N., R. 13 W., M. D. B. and M., for irrigation and domestic purposes (5 acres). Estimated cost \$400.

SIERRA COUNTY—Application 7225. Kanaka Mines Syndicate, c/o L. E. Lee, Mgr., 2744 Steiner St., San Francisco, for 20 c.f.s. from Kanaka Creek tributary to Middle Fork Yuba River to be diverted in Sec. 9, T. 18 N., R. 10 E., M. D. B. and M., for power purposes (21 H.P.).

SAN BERNARDINO COUNTY—Application 7226. Panamint Mining Co., c/o Feemster, Perkins & McCormick, Attys., Bank of America Bldg., Visalia, for 1000 g.p.d. from Natural Spring to be diverted in Sec. 21, T. 26 S., R. 45 E., M. D. B. and M., for domestic purposes. Estimated cost \$200.

VENTURA COUNTY—Application 7227. Ray La Vallee, 1331 3d St., Bakersfield, for 0.125 c.f.s. and 5 acre-feet per annum from Sam Young Spring tributary to Cuddy Canyon to be diverted in Sec. 6, T. 3 N., R. 19 W., S. E. B. and M., for irrigation and domestic purposes (400 acres). Estimated cost \$2,000.

LOS ANGELES COUNTY—Application 7228. Dean A. Davis, c/o Geo. R. Castle, 431 Southwest Bldg., Los Angeles, for 2 gallons per minute from 4 unnamed springs tributary to Santa Clara River to be diverted in Sec. 23, T. 4 N., R. 13 W., S. B. B. and M., for domestic purposes. Estimated cost \$500.

SHASTA COUNTY—Application 7229. C. B. Limp-right, c/o Wm. L. Harris, 375 Mills Bldg., San Francisco, for 10 c.f.s. from Boulder Creek tributary to Clear Creek, thence Sacramento River to be diverted in Sec. 33, T. 32 N., R. 6 W., M. D. B. and M., for mining and domestic purposes. Estimated cost \$5,000.

SHASTA COUNTY—Application 7230. C. B. Limp-right, c/o Wm. L. Harris, 375 Mills Bldg., San Francisco, for 4 c.f.s. from Brandy Creek tributary to Clear Creek, thence Sacramento River to be diverted in Sec. 29, T. 32 N., R. 6 W., M. D. B. and M., for mining and domestic purposes.

SOLANO COUNTY—Application 7231. Mrs. Clara Peck, c/o A. E. Morse, Cordelia, for 0.5 c.f.s. from Greenvalley Creek tributary to Suisun Bay to be diverted in Sec. 26, T. 5 N., R. 3 W., M. D. B. and M., for irrigation purposes (40 acres).

YOLO COUNTY—Application 7232. Rose Vargas Rose, 3709 Bigler Way, Sacramento, for 0.32 c.f.s. from Sacramento River tributary to Suisun Bay to be diverted in Sec. 22, T. 7 N., R. 4 E., M. D. B. and M., for irrigation purposes (26 acres).

EL DORADO COUNTY—Application 7233. B. W. Stone, 161 Ellis St., San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River, (2) Pilot Creek, (3) Gerle Creek, (4) Loon Lake, (5) Buck Island Lake, (6) Rock Bound Lake, (7) Little S. Fork Rubicon River tributary to American River Drainage Area to be diverted in Sec. 9, T. 13 N., R. 16 E., M. D. B. and M., Sec. 11, T. 12 N., R. 12 E., M. D. B. and M., Sec. 24, T. 13 N., R. 13 E., M. D. B. and M., Secs. 11, 31, 34, T. 14 N., R. 14 E., M. D. B. and M., Sec. 4, T. 13 N., R. 15 E., M. D. B. and M., and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

TRINITY COUNTY—Application 7234. J. S. Rivers, c/o W. Ernest Dickson, 1st National Bank Bldg., Eureka, for 8 c.f.s. from Lake Creek and Hennessey Creek tributary to Trinity River to be diverted in Secs. 3 and 10, T. 5 W., R. 6 E., H. B. and M., for mining purposes.

CALAVERAS COUNTY—Application 7235. Comanche Mining Co., Comanche, for 3 c.f.s. from Mokelumne River tributary to San Joaquin River to be diverted in Sec. 5, T. 4 N., R. 10 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$2,000.

INYO COUNTY—Application 7236. American Potash & Chemical Corporation, Trona, for 0.00736 c.f.s. from Indian Joe Canyon tributary to Searles Lake to be diverted in Sec. 24, T. 24 S., R. 42 E., M. D. B. and M., for industrial and domestic purposes.

HUMBOLDT COUNTY—Application 7237. James Henry Hilton, Korb, for 1.0 c.f.s. from Jake Miller Gulch tributary to Klamath River to be diverted in Sec. 1, T. 9 N., R. 4 E., H. B. and M., for mining purposes.

MENDOCINO COUNTY—Application 7238. Curtis T. Orwick, Cummings, for 1.0 c.f.s. from Squaw Creek tributary to Rattlesnake Creek thence S. Fork Eel River to be diverted in Sec. 20, T. 23 N., R. 16 W., M. D. B. and M., for recreational and domestic purposes. Estimated cost \$200.

PLACER COUNTY—Application 7239. C. W. Earle, Rocklin, 0.1 c.f.s. from Secret Ravine tributary to Dry Creek thence Sacramento River to be diverted in Sec. 20, T. 11 N., R. 7 E., M. D. B. and M., for irrigation purposes (8 acres). Estimated cost \$500.

HUMBOLDT COUNTY—Application 7240. Fred Brace, Orleans, for 2 c.f.s. from Wilson Creek, tributary to Klamath River to be diverted in Sec. 17, T. 11 N., R. 6 E., H. B. and M., for mining purposes.

EL DORADO COUNTY—Application 7241. United States, El Dorado National Forest, c/o Edwin P. Smith, Supervisor, Placerville, for 1600 g.p.d. from Dartmouth Cove Creek tributary to Upper Echo Lake to be diverted in Sec. 2, T. 11 N., R. 17 E., M. D. B. and M., for domestic purposes. Estimated cost \$250.

DEL NORTE COUNTY—Application 7242. United States, Siskiyou National Forest, c/o G. E. Mitchell, Supervisor, Grants Pass, Oregon, for 0.017 c.f.s. from unnamed stream tributary to Middle Fork Smith River to be diverted in Sec. 32, T. 18 N., R. 4 E., H. B. and M., for domestic purposes.

DEL NORTE COUNTY—Application 7243. United States, Siskiyou National Forest, c/o G. E. Mitchell, Supervisor, Grants Pass, Oregon, for 0.017 c.f.s. from unnamed stream tributary to Smith River to be diverted in Sec. 29, T. 17 N., R. 2 E., H. B. and M., for domestic purposes. Estimated cost \$850.

KERN COUNTY—Application 7244. B. O. Bradshaw and W. I. Wyman, c/o W. I. Wyman, Isabella, for 2.5 c.f.s. from French Gulch Creek tributary to Kern River to be diverted in Sec. 20, T. 26 S., R. 32 E., M. D. B. and M., for mining purposes.

SISKIYOU COUNTY—Application 7245. C. Scott Greening, c/o Tebbe & Tebbe, Attorneys, Peters & De Witt Bldg., Yreka, for 25 c.f.s. from West Fork of Indian Creek tributary to Indian Creek thence Klamath River to be diverted in Sec. 23, T. 18 N., R. 6 E., H. B. and M., for mining purposes. Estimated cost \$150.

SISKIYOU COUNTY—Application 7246. George T. Ostrom, c/o Kilpatrick & Goodman, Attorneys, Latham Square Bldg., Oakland, for 7.5 c.f.s. from T Bar Creek tributary to Klamath River to be diverted in Sec. 13, T. 13 N., R. 6 E., H. B. and M., for power purposes (340.9 H.P.). Estimated cost \$10,000.

SISKIYOU COUNTY—Application 7247. George T. Ostrom, c/o Kilpatrick & Goodman, Attorneys, Latham Square Bldg., Oakland, for 7.5 c.f.s. from T Bar Creek tributary to Klamath River to be diverted in Sec. 13, T. 13 N., R. 6 E., H. B. and M., for mining purposes. Estimated cost \$10,000.

SIERRA COUNTY—Application 7248. George W. Hallock, c/o R. E. Taylor, Downieville, for 12.5 c.f.s. from Jim Crow Canyon tributary to north Fork Yuba River to be diverted in Sec. 15, T. 19 N., R. 11 E., M. D. B. and M., for mining purposes. Estimated cost \$3,000.

MENDOCINO COUNTY—Application 7249. Eugene Provost, Dos Rios, for 0.025 c.f.s. from unnamed creek tributary to Eel River to be diverted in Sec. 24, T. 22 N., R. 14 W., M. D. B. and M., for domestic and recreational purposes. Estimated cost \$300.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of April, 1932.

HUMBOLDT COUNTY—Permit 3874. Application 7179. Thomas H. Selva, Eureka, April 4, 1932, for .022 c.f.s. from unnamed spring in Sec. 30, T. 2 S.,

Water Permits and Applications in April

(Continued from page 37)

R. 1 W., H. B. and M., for irrigation and domestic purposes on 8 acres. Estimated cost \$300.

HUMBOLDT COUNTY—Permit 3875, Application 7062. Arthur McBride, Winford Ottley and Ralph Peters, Orleans and George W. Smith of Etna, April 6, 1932, for 3 c.f.s. from Five Mile Creek in Sec. 16, T. 11 N., R. 6 E., H. M., for mining and domestic purposes. Estimated cost \$1,200.

MENDOCINO COUNTY—Permit 3876, Application 6930. Amanda P. Day, Cummings, April 9, 1932, for 0.087 c.f.s. from Big Dann Creek tributary to S. Fork Eel River in Sec. 12, T. 23 N., R. 17 W., M. D. B. and M., for domestic and irrigation purposes on 5 acres. Estimated cost \$500.

EL DORADO COUNTY—Permit 3877, Application 7164. Verne W. Drake, Greenwood, April 9, 1932, for 1.0 c.f.s. from Jackass Creek and Orillo Creek tributary to Greenwood Creek and S. Fork American River in Sec. 7, T. 12 N., R. 10 E., M. D. B. and M., for mining purposes. Estimated cost \$25.

SISKIYOU COUNTY—Permit 3878, Application 7068. L. E. Hallford, Happy Camp, April 9, 1932, for 3.00 c.f.s. from Phillips Gulch tributary to Oak Flat Creek thence Klamath River in Sec. 30, T. 16 N., R. 7 E., H. B. and M., for mining purposes. Estimated cost \$2,000.

NEVADA COUNTY—Permit 3879, Application 7050. R. A. Chipman, Nevada City, April 13, 1932, for 0.50 c.f.s. from Dutch Flat Canyon tributary to Bear River in Sec. 34, T. 16 N., R. 10 E., M. D. B. and M., for mining and domestic purposes.

SAN JOAQUIN COUNTY—Permit 3880, Application 6748. Ralph and George W. Coffey, 1402 Oakland Bank Bldg., Oakland, April 14, 1932, for 3.72 c.f.s. from Lone Tree Creek tributary to San Joaquin River in Sec. 26, T. 1 S., R. 8 E., M. D. B. and M., for irrigation of 297.2 acres. Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Permit 3881, Application 6916. Aubrey Wardman, Whittier, April 14, 1932, for 2.50 c.f.s. from underground water from unnamed canyon tributary to Santa Ana River in Sec. 16, T. 1 N., R. 6 W., S. B. B. and M., for domestic and irrigation purposes of 350 acres. Estimated cost \$25,000.

PLUMAS COUNTY—Permit 3882, Application 6728. W. H. Morrison, Indian Fall Lodge, Plumas County, April 20, 1932, for 0.20 c.f.s. from 2 unnamed springs tributary to Indian Creek and Feather River in Sec. 3, T. 25 N., R. 9 E., M. D. B. and M., for domestic purposes. Estimated cost \$3,000.

SAN DIEGO COUNTY—Permit 3883, Application 7035. Marion Webber, Palomar Mountain, Cal., April 22, 1932, for 0.05 c.f.s. from a spring tributary to Cutca Creek and Temecula River in Section 29, T. 9 S., R. 1 E., S. B. B. and M., for domestic use and the irrigation of 40 acres. Estimated cost \$1,000.

BUTTE COUNTY—Permit 3884, Application 7192. Shelley E. Lee, Box C, Biggs, April 25, 1932, for 3.00 c.f.s. from Main South Canal of Reclamation District No. 100 tributary to Butte and Sacramento rivers in Sec. 14, T. 18 N., R. 1 E., M. D. B. for the irrigation of 149 acres. Estimated cost \$3,000.

SAN JOAQUIN COUNTY—Permit 3885, Application 6963. C. H. Wallace and R. A. Caswell, Route 4, Box 304, Modesto, April 28, 1932, for 8.94 c.f.s. from Stanislaus River tributary to San Joaquin River in Sec. 3, T. 3 S., R. 7 E., M. D. B. and M., for domestic use and the irrigation of 715 acres. Estimated cost \$4,000.

SOLANO COUNTY—Permit 3886, Application 7194. James McNully Est., c/o Lola Dodini, R. F. D. No. 1, Box 26, Suisun, April 28, 1932, for 0.87 c.f.s. from Ledgewood Creek tributary to Suisun Bay in Sec. 8, T. 5 N., R. 2 W., M. D. B. and M., for the irrigation of 70 acres.

It's all right for a woman to hold on to her youth—but not while he is driving.

"Where's old Bill been lately? I haven't seen him for months."

"What? Haven't you 'eard? He's got three years for stealin' a car."

"What did he want to steal a car for? Why didn't he buy one an' not pay for it, like a gentleman!"

—*The Outspan.*

In Memoriam

SAMUEL HERZ, father of James I. Herz, Deputy Director of the Department of Public Works, died at the French Hospital in San Francisco May 10th from injuries sustained when he was struck down by a hit-and-run driver in that city April 21st. Mr. Herz and his wife were waiting to board a street car when the accident occurred. In a heroic effort to save her from injury, Mr. Herz pushed his wife out of the direct path of the onrushing vehicle and was himself struck down.

Born in Rumania, Mr. Herz was 60 years old. He had been a manufacturer in San Francisco for many years and was active in fraternal and community life of the city. He is survived by his widow, Mrs. Elsie Herz, two sons, James I. and Jay J. Herz, a daughter, Mrs. Milton Jellins, two grandsons and two granddaughters.

OILING CONTRACTS LET IN MANY COUNTIES

(Continued from page 27)

Trucking Co., Taft, \$5,586. Contract awarded to Lee J. Immel, Berkeley, \$4,712.

TRINITY COUNTY—Dist. II, Rt. 20. The furnishing and application of fuel oil on portions of State highway between Weaverville and White's Bar Creek. Basalt Rock Co., Inc., Napa, \$8,751.04. Contract awarded to Skeels & Graham Co., Roseville, \$7,550.44.

TUOLUMNE COUNTY—Dist. X, Rt. 13. Between Stoddard Springs and Que de Porka, about 36.3 miles in length to be treated with fuel oil as a dust palliative. A. Teichert & Son, Inc., Sacramento, \$8,915; Basalt Rock Co., Inc., Napa, \$9,383.50. Contract awarded to Tiffany, McReynolds, Tiffany, San Jose, \$8,725.

TUOLUMNE AND MARIPOSA COUNTIES—Dist. X, Rt. 18-40. Between Mountain Pass and Yosemite National Park, about 32.2 miles. Furnishing and applying fuel oil and asphaltic road oil. A. Teichert & Son, Inc., Sacramento, \$12,379; Skeels & Graham Co., Roseville, \$10,740; Basalt Rock Co., Inc., Napa, \$9,636.20; F. W. Nighbert, Bakersfield, \$12,595.10; Oilfields Trucking Co., Taft, \$13,329; C. F. Fredericksen & Sons, Lower Lake, \$8,754.10. Contract awarded to C. W. Wood, Stockton, \$7,880.50.

YUBA, NEVADA AND SIERRA COUNTIES—Dist. III, Rt. 15-25. About 66.2 miles to be treated with asphaltic road oil as a dust palliative. C. W. Wood, Stockton, \$9,810; Basalt Rock Co., Inc., Napa, \$8,617.50; Skeels & Graham Co., Roseville, \$9,117.50; Oilfields Trucking Co., Taft, \$10,219.60; Tiffany, McReynolds, Tiffany, San Jose, \$9,463.30. Contract awarded to C. F. Fredericksen & Sons, Lower Lake, \$7,731.20.

Jack and Jill
Sped down a hill
And hit a curve quite sharp;
The car turned turtle,
Jack's wreath was myrtle,
And Jill is playing the harp.

Just because the course of true love never did run smooth, don't think the detours run any smoother.

—*No. Dakota Highway Bulletin.*

"Animals," says a naturalist, "don't know how lucky they are." Does a family of rabbits, for instance, realize that they are running about in a beautiful sealskin coat?—*Punch.*

Santa Clara River Bridge, Longest Steel Span in State, Dedicated May 13

By V. A. ENDERSBY, Construction Engineer, Bridges

THE old Santa Clara River Bridge has been honorably discharged for disability in the service of the State of California by the construction of the longest steel bridge so far built on State Highway.

The original bridge was built in various sections from 1898 to 1916 and has long since been both weak from old age and dangerously narrow for present day traffic. It has been supported by underpinning for

future widening will involve no junking of present structure.

A large part of the work of the State Highway Bridge Department during the past years has been widening, in some cases doubling or tripling the width of, relatively new structures.

The cost of this bridge was extremely low as compared with what it would have been a few years ago, or with the cost of a structure with old type high trusses. The allotment made for construction was \$296,400 and the actual cost will be \$289,500, which includes the making of approach fills and temporary oiled surfacing not contemplated in the original contract and which features enable the opening of the bridge long before it would otherwise have been available for public use, as the construction of pavement, which will begin shortly, will occupy some time. H. R. Lendecke was resident engineer for the State.

In August, 1898, Ventura County turned out in wagons and buggies to witness the ceremonies that opened the first bridge across the Santa Clara River. On May 13, thirty-four years later, citizens of Ventura County with State, county and municipal officials drove out in two processions of modern automobiles from Oxnard and Ventura to dedicate the new bridge.



LONG WATER JUMP is made by this new Santa Clara River bridge. Trusses of old structure show on left.

some time past, and during the floods of last winter was at times in serious danger of collapse. Undoubtedly, however, the original structure built in 1898 was very probably regarded as in excess of the needs of that day.

The new bridge is 1806 feet long, consisting of 21 86-foot deck plate girder spans on concrete piers resting on steel piling. The bridge has a concrete deck. This type of construction is extremely economical, first, because placing the main supporting members under the roadway permits a much lighter floor construction; second, rapid construction is possible because the steel can be built while the piers are under construction and can be rapidly placed when the piers are finished, many of these spans having been swung into place at the rate of one per day; third, the design of the steel being very plain and simple, the shop costs are low; fourth, the concrete deck can be supported while pouring upon the steel work so that expensive falsework is unnecessary.

The old bridge had a roadway width of 20 feet while the new structure will have a 42-foot roadway and one 5-foot sidewalk. It is to be noted that between the early part of 1924 and 1929, the maximum daily traffic rose from approximately 3000 vehicles per day to almost 12,000, or a four-fold increase. Study of traffic possibilities led the designers to provide for future additional widening on the north side of the bridge, even as constructed. This provision was made by constructing a detachable rail and curb and incorporating a connection in the steel work so that any



JUNK PILE awaits this narrow old wooden structure with its unsightly overhead girder trusses built in 1898.

The caravans met at the center of the long steel and concrete structure where appropriate dedicatory ceremonies were held participated in by George C. Power, City Councilman of Ventura, the only living member of the group of county officials who built the first bridge; Jack Miller, Secretary of the Oxnard Chamber of Commerce; Mayor George Hartman of Ventura; Mayor E. R. Gill of Oxnard; Fred Smith, President of the Ventura Chamber of Commerce; E. R. Squires, President of the Oxnard Chamber, and A. F. Walden, President of the Ventura County Chamber; T. G. Gabbert, Chairman of Ventura Supervisors, and S. V. Cortelyou, District Engineer of the California Department of Public Works, Highway Division, representing the State.

Forecasts of Stream Flow Published

(Continued from page 33)

condition which has not obtained for several years, and which has given an opportunity for tests of percolation which will be useful should the district proceed with the plan of development which has been proposed, and has afforded some data which will be useful in estimating the yield of the various watersheds tributary to the valley.

Napa Valley Investigation—The water level was taken during March in all wells which were under observation in connection with this investigation and a series of percolation measurements was taken on Conn Creek for the purpose of establishing the behavior of this stream during the early spring months. It is expected that this series of measurements will be repeated at an early date after pumping has started from the various wells in adjacent areas. Stream gagings were made on Napa River, Rector, Dry and Conn creeks and thereafter gages were regularly observed once each week.

STATE WATER PLAN

Bulletin No. 28, Division of Water Resources, entitled "Economic Aspects of a Salt Water Barrier Below Confluence of Sacramento and San Joaquin Rivers," one of a series of reports prepared on the State Water Plan, was released by the State Engineer on March 24, 1932.

The report presents the results of a comprehensive investigation as to the economic aspects of a salt water barrier. This investigation has involved a survey and study of the upper bay and delta regions, with particular reference to manufacturing industries, industrial water front structures, irrigation, reclamation, flood control, navigation, fishing, municipalities, sewage and industrial waste disposal, and the effect of a barrier thereon. Estimates have been made of immediate future and ultimate water requirements for all purposes.

An essential feature of the investigation has been a study of alternate plans, with and without a barrier, to provide the basic requirements of salinity control and dependable fresh-water supplies for the upper bay and delta regions. The purpose of this study was to determine, if possible, the most practicable and economical means of supplying present and ultimate water demands and facilitating the development of industries, municipalities and agriculture in the area. Finally, consideration has been given to the necessity and economic justification of a barrier, not only as a means for serving the needs of the upper bay and delta regions but also as a unit for attaining the maximum conservation and utilization of the State's water resources.

On April 22, the California Water Resources Commission held a meeting in San Francisco to further consider the initial units of the State Water Plan proposed for immediate development of the State's water resources and the formulation of a constitutional amendment providing for its fulfillment.

"There is a job some excavating contractor abandoned once upon a time, probably long ago and before our time," said a contractor to his wife as they were driving along observing some mountains in the distance.—*Texas Highways*.

In Memoriam

AGNES M. REARDON, wife of Timothy A. Reardon, California Highway Commissioner and Chief of the State Division of Labor Statistics and Law Enforcement, died of pneumonia at her home in San Francisco on May 17.

Born in San Francisco, Mrs. Reardon was the daughter of Captain John O'Neil, a distinguished soldier and officer who rode with General Phil Sheridan throughout the Civil War. Her whole life was devoted to charitable work. She took an active part in every patriotic campaign during the World War and was prominent in every public charitable drive in San Francisco.

Mrs. Reardon was the mother of two sons, William A. and Louis V., who survive her and two daughters, both deceased. One daughter, Eileen, wife of James A. Toner, died recently in San Francisco. Her other daughter, Agnes, died some years ago.

INSTITUTION FOR WOMEN NEAR TEHACHAPI DEDICATED BY GOVERNOR

(Continued from page 28)

selves will be greatly increased beyond what it has been heretofore in this State.

The California Institution for Women constitutes the Division of Women's Prisons of the State Department of Penology of which Daniel J. O'Brien is Director. The institution is operated under the management of a Board of Trustees composed of five members, the present membership being Mrs. Ernest Wallace, Chairman; Miss Grace Barneberg, Judge T. N. Harvey and Mr. W. Kee Maxwell. Mrs. Wallace by virtue of her position as Chairman of the Board is the Chief of the Division of Women's Prisons. Miss Alicia Mosgrove is the Superintendent.

The Division of Architecture in designing and erecting the buildings and other structures has had the very important assistance of Mrs. Helen Van Pelt as Landscape Architect.

SAFETY IN COLORS

Thousands of accidents, many of them fatal, occur each year to persons walking on highways wearing dark clothing which makes it practically impossible for drivers to see them, according to the public safety department of the Automobile Club of Southern California. In addition to facing traffic while walking on a motor road, pedestrians can add to their safety by wearing some piece of light colored clothing.

Open cars manufactured in the United States last year numbered only 160,000, as compared with 1,880,000 closed cars produced.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR. _____ Governor

COLONEL WALTER E. GARRISON _____ Director

JAMES I. HERZ _____ Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

EARL LEE KELLY, Chairman, Redding

HARRY A. HOPKINS, Taft

TIMOTHY A. REARDON, San Francisco

PHILIP A. STANTON, Anaheim

FRANK A. TETLEY, Riverside

C. H. PURCELL, State Highway Engineer, Sacramento

JOHN W. HOWE, Secretary

HUGH K. McKEVITT, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

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FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division

J. J. HALEY, Jr., Administrative Assistant

HAROLD CONKLING, Deputy in Charge Water Rights

A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

SPENCER BURROUGHS, Attorney

EVERETT N. BRYAN, Hydraulic Engineer, Water
Rights

A. N. BURCH, Irrigation Investigations

H. M. STAFFORD, Sacramento-San Joaquin Water
Supervisor

GORDON ZANDER, Adjudication, Water Distribution

KATHERINE A. FEENY, Chief Clerk

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H. W. DeHAVEN, Chief Architectural Draftsman

C. H. KROMER, Structural Engineer

CARLETON PIERSON, Specification Writer

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C. E. BERG, Engineer, Estimates and Costs

J. W. DUTTON, General Superintendent Construction

W. H. ROCKINGHAM, Mechanical Engineer

C. A. HENDERLONG, Assistant Mechanical Engineer

W. M. CALLAHAN, Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. BURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed



Port of San Diego—Edwin P. Sample

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

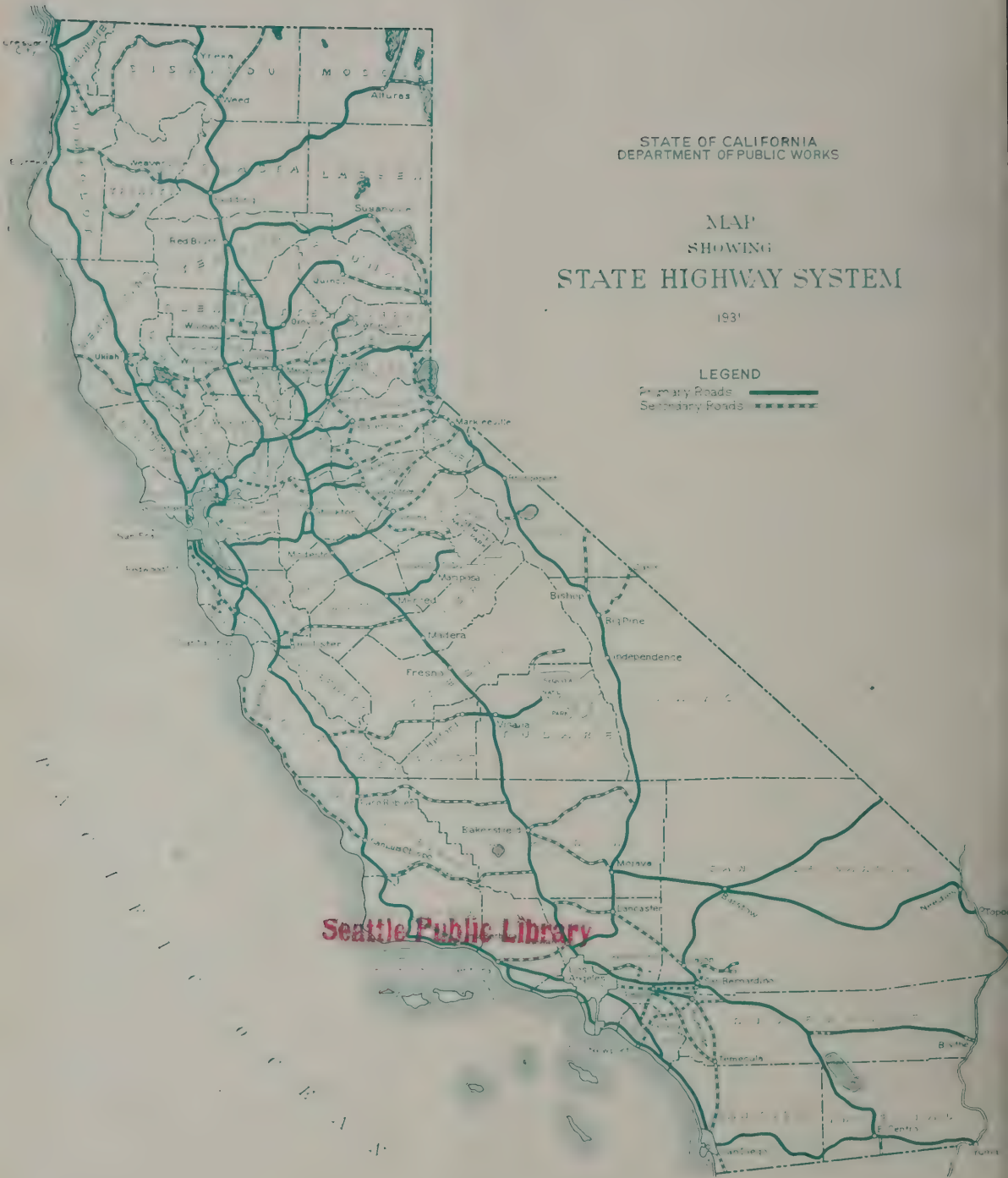
MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND

Primary Roads 
Secondary Roads 

Seattle Public Library



CALIFORNIA HIGHWAYS and PUBLIC WORKS

*Scene on State Highway No. 11
in the American River Canyon*



Official Journal of the Department of Public Works
State of California

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Governor's Water Commission Reports Plan to Solve State's Great Problem

Thirteen Recommendations Include Constitutional Amendment, Bond Act, Central Valley Project, Permanent Commission, all Projects Self-sustaining, Self-liquidating

GOVERNOR ROLPH received on June 21, 1932, the report of the California Water Resources Commission which had been appointed by him in August, 1931, under authority of the Legislature and headed by the Honorable Matt I. Sullivan, former Chief Justice of Supreme Court of California, to study and report on the water problems of California.

The Governor was well pleased and gratified with the report and stated: "This Commission has rendered a great public service to which the people of California should justly be proud."

The Governor has taken a keen and active interest, a broad and state-wide viewpoint and has exhibited outstanding leadership in evolving a plan for the solution of the State's most important and pressing problem. In his inaugural address on January 5, 1931, he stated:

"I stand ready as Governor to give the Legislature and the distressed localities all the assistance in my power toward finding a practicable solution of these pressing problems. * * * Distinctly the duty of relieving the acute situation caused by the uneven distribution of our water resources and the growing demand on them is mainly the business of the State and not solely of the affected localities."

The Governor realized from the beginning that there was a Federal interest in Cali-

fornia's water problem to the solution of which the Federal Government should contribute financially in a substantial degree. Within a month after his inauguration he dispatched, in accord with the recommendation of the Federal-State Water Resources

Commission, a committee, composed of State officials, legislative representatives and citizens, to Washington, D. C., to make immediately public a War Department report on the Sacramento-San Joaquin Valley project and to arrange for a congressional committee to visit California and study the water problems of the State. He was successful in both of these objectives.

When the Governor appointed the California Water Resources Commission he also appointed honorary advisory committees to assist them, representative of all interests and localities in the State, including former governors, and California members of United States Congress.

The Governor kept in intimate touch with proceedings of both the California Water Resources Commission and those of the California Joint Legislative Water Committee by attending many meetings and at all times lent his assistance and support.

SENT TO WASHINGTON

On June 20, 1932, he authorized a committee of the California Water Resources Com-



JAMES ROLPH, Jr.
Governor of California

Truck Traffic on California State Highways as Shown by Joint Survey

By T. H. DENNIS, Maintenance Engineer

Rural-owned trucks make a greater use of our State road system than city-owned vehicles. The majority of trucks on the highways are owned and operated by the load owners. Foreign truck traffic is less than 5 per cent of the daily total. These are some of the interesting facts disclosed by a joint survey made by the Federal Bureau of Public Roads and the California Division of Highways as told in this second of two articles by T. H. Dennis, analyzing the results of the survey. The first article appeared in the May issue.

TRUCKS constitute 9.5 per cent of all motor vehicles operated on California's State highways. Of this number 23.1 per cent are trucks of three tons and over capacity.

A segregation based on ownership and use indicates that 93 per cent are owner-operated; that is, both load and truck are owned by the same agency; 3 per cent are contract operated under hauling agreements with a few agencies; 3 per cent common carriers operating intrastate for hire over a fixed route on regular schedule and at published rates and 1 per cent common carriers operating interstate on the same basis as the intrastate trucks.

The above statements are facts ascertained through the joint survey conducted by the Bureau of Public Roads, United States Department of Agriculture and the California Division of Highways during the period September, 1929, to October, 1930. This cooperative survey extended to and was participated in by the State Highway Departments of the 11 western states. The investigation was undertaken in order to obtain essential facts about the present density, type, capacities and distribution of traffic units as a basis for planning highway development to serve present and future traffic.

TRUCK DISTRIBUTION

The most outstanding trucking areas in California are southern California, the San Francisco Bay section, and the Sacramento and San Joaquin valleys. In the south the heaviest truck traffic on State highways operates in and out of Los Angeles to San Diego, Santa Barbara, Bakersfield, Pasadena, San Bernardino and the Imperial Valley over U. S. Routes Nos. 101, 99 and 66.

The greatest concentration is on U. S. No. 101 between Los Angeles and Whittier, there being nearly 1400 trucks per day, of which 350 are trucks of greater than 3-ton capacity. Between Whittier and San Diego on the same route there are only 400 trucks per day, of which 100 are in the heavy class.

Trucking between Los Angeles and Santa Barbara on U. S. No. 101, as well as between Los Angeles and Bakersfield on U. S. No. 99 reflects the demands of the oil industry, the average daily number of heavy trucks on the former route being 200 per day, while on the latter route 100 out of 300 trucks fall within this classification.

Truck traffic on U. S. No. 66 and U. S. No. 99 from Los Angeles to Pasadena, San Bernardino, and El Centro reflects the commodities handled, namely citrus fruits and farm products, there being but 100 trucks of three-ton and over capacity out of the 400 trucks which daily use this route.

NORTH HOLDS RECORD

San Francisco and Oakland occupy a position similar to Los Angeles in the production of truck traffic on the State highways. The heaviest trucking in this area is over U. S. No. 101, between San Francisco and Gilroy, there being an average of 800 trucks daily, of which 150 are of more than three-ton capacity.

The greatest volume of truck traffic in the State was recorded on this route between Santa Clara and San Jose, an average of more than 2272 trucks per day, of which approximately 300 were heavy trucks. A great portion of this movement is caused by the transportation of fruit in the Santa Clara Valley to rail heads.

There is also a considerable volume of truck traffic on U. S. No. 101 between San Francisco and Healdsburg, resulting prin-

(Continued on page 14)



TRUCK TRAFFIC, an important service of the highways, is carrying the fruits of industry in large volume from producer to market or consumer throughout California as shown in the above scenes taken on State routes. No. 1, produce hauling on the Bayshore Highway near Burlingame. No. 2, trucking oil pipe on Ridge Route. Nos. 3 and 4, traffic on State Route 5, near San Jose, and on the Bayshore underpass, South San Francisco. No. 5, lumber loads on Route 4 E, near Newhall. Nos. 6 and 8, loads of grain on the Peninsula Highway. Nos. 7 and 9, Hauling case goods and grain on Golden State Highway, San Joaquin Valley. No. 10. Milk going to market in Alameda County. Nos. 11 and 12, hauling for gasoline and oil industry in southern California.

Highway Being Pushed 35 Miles Into Rugged Wilds of Kings River Canyon

IT IS still possible to find enough variation in certain road-building projects to prevent the life of engineers and road builders from becoming a monotonous and humdrum existence. An example of such a project is Fre-41, the new State highway into the Kings River Canyon, now being constructed.

This work extends from General Grant National Park, in the high Sierra of Fresno County, back into a region less well known because of its past isolation and inaccessibility, a distance of approximately 35 miles.

The third winter of camp life has been spent in this region by approximately 130 men, and the predictions of the "old timers" in the vicinity regarding a hard winter recently came true.

Some 50 miles of county-built mountain road connect the National Park and the beginning of the State highway construction, with civilization. As the snow piled up, during the past winter, trucks and tractors with snow plows, and, finally, a rotary plow were resorted to in an effort to maintain communication.

DEEP SNOW PACK

Near Grant Park the mountain road, usually wide enough for two cars, became a narrow one-way pass in a vast expanse of snow pierced by the great Sequoia trees. A sled pulled by a caterpillar tractor was the favorite freight carrier and snow-shoes were sometimes the only sure means of human locomotion.

Construction was interrupted during the winter only when work was impossible, and the crew was then often used in prevention and repair of storm damage to the constructed portion, which now extends about 12 miles. It is expected to extend the portion open to public travel, to a point about $7\frac{1}{2}$ miles from the beginning of the project, during the summer.

At this location a turn in the road exposes suddenly to view the junction of the Middle and South Forks of the Kings River, a sight extremely beautiful and impressive because of the grandeur of the canyons and the enormous expense visible at one gaze.

The construction camp has recently been moved to a location at the junction of Indian

and Ten Mile Creeks, about 12 miles east of Grant Park. As an indication of the wildness of this country, it was recently necessary to alter the water supply of the camp because of the large number of deer which had been killed in the vicinity by mountain lions—the carcasses making the water unfit for use.

Progress of construction (considering quantity of material moved) is to be more rapid in the future, as a third Diesel shovel was recently added to the power equipment. The distance constructed will increase at a slower rate, however, for the work has now reached the heaviest construction on the entire 35-mile project. The location requires a roadbed, mostly benched, along an almost vertical granite cliff in the South Fork Canyon.

The main canyon of South Fork, about seven miles long with nearly vertical walls in many places rising to a height of half a mile, has been compared to the Yosemite Valley. Like this famous national park, a multitude of mountain lakes feed the river which made the canyon and these will be accessible as the road penetrates the region.

It is expected that about one-third of the entire project will be completed by the first of July.

California Shows Gain In General Car Slump

California maintained a leading position among states in automobile supremacy last year, it is indicated in reports from the Bureau of Public Roads.

According to the Bureau, last year there were 731,178 fewer motor vehicles on the highways than in 1930, when the registration for the country was 26,545,281. This is a national average decrease of 2.7 per cent from the previous year.

California, however, did not share in this decrease in number of vehicles, but on the contrary showed an increase of .38 of one per cent.

The automobile industry in the United States consumed last year eighty-three per cent of the rubber manufactured in the country.



ROAD TO PARADISE for the lover of scenic grandeur would fittingly describe the Kings River Canyon Highway now under construction. No. 1 shows the present "end of the trail." No. 2, a blasting operation for new construction. No. 3, grading equipment at work. No. 4, unloading gasoline at "the front" for motor and camp use.

Fiscal Advisory Board Named for San Francisco-Oakland Bay Bridge

WITH final designs being rapidly completed on the San Francisco-Oakland Bay Bridge, the Department of Public Works is turning its attention to consideration of fiscal problems. Governor James Rolph, Jr., at the request of Colonel Walter E. Garrison, State Director of Public Works, has appointed an "Advisory Fiscal Committee" in connection with the Bay Bridge project. The committee, which is composed of financial, civic, and labor leaders representing both sides of the bay, includes the following:

Harrison S. Robinson, Oakland attorney and civic leader; **George T. Cameron**, publisher of the *San Francisco Chronicle* and a member of the Hoover-Young Commission; **Joseph Carlston**, President of the Central Bank of Oakland; **Charles O. Conrad**, Vice President of Alameda County Building Trades Council; **W. W. Crocker**, Vice President of the Crocker First National Bank of San Francisco; **Leland W. Cutler**, President of the San Francisco Chamber of Commerce; **E. B. DeGolia**, President of the California State Automobile Association; **R. M. Fitzgerald**, member of the law firm of Fitzgerald, Abbott & Beardsley, Oakland; **Herbert Fleishhacker**, President of the Anglo & London Paris National Bank of San Francisco; **A. P. Giannini**, Chairman of the Executive Board of the Bank of America and Transamerica, San Francisco; **R. H. Glassley**, President of the Oakland Chamber of Commerce; **E. Clarence Holmes**, President of the Executive Board, Bureau of Governmental Research, Berkeley; **Joseph R. Knowland**, Vice President, State Chamber of Commerce, Oakland; **Frank C. McDonald**, President of the State Building Trades Council of California, San Francisco; **P. H. McCarthy**, well known labor leader and former Mayor of San Francisco; **J. H. Quinn**, President of the Alameda County Building Trades Council, Oakland; **John P. Symes**, **R. H. Moulton & Co.**, San Francisco; and **George Tourny**, President of the San Francisco Bank, San Francisco.

MET AND ORGANIZED

The committee held its organization meeting, presided over by Colonel Garrison and

attended by Chief Engineer Charles H. Purcell, and elected Harrison S. Robinson president, Leland W. Cutler vice president, Charles H. Purcell secretary, and D. V. Nicholson, administrative assistant, assistant secretary.

Colonel Garrison outlined the purpose of the committee, as follows:

I—To assist in bringing about an agreement between the interurban lines for the use of the bridge; and analysis of data already prepared by both the interurban companies and State authorities on the interurban fiscal phases of the Bay Bridge.

II—To advise State authorities on all financial problems involved.

III—To advise on the question of bond interest and discount, and the term of bond best adapted to the particular case; also as to the necessary steps to be taken to submit this data to bankers; and as to the checking of income data by a firm of financial advisers.

PLANS APPROVED

State Highway Engineer Purcell and his two assistants, Chas. E. Andrew, bridge engineer, and Glen B. Woodruff, engineer of design, recently spent five days in New York conferring with Messrs. Moran and Proctor and their staff in connection with foundation details. The general foundation plan already has the approval of the Consulting Board of Engineers, headed by Ralph Modjeski.

The bridge engineering staff has completed final design for tower No. 3 of the Bay Bridge. This design calls for the expenditure of \$1,250,000 for the steel tower and \$1,750,000 for pier and fenders.

This tower will be located 2300 feet off San Francisco pierhead line at Pier 24, situated just south of Harrison Street. The concrete pier which will be sunk 220 feet to bedrock, will be 70 feet by 140 feet. With fenders, the overall dimensions will be 100 feet by 180 feet. This tower will rise 214 feet to the deck and 505 feet to the top of the tower.

WILL CARRY BEACONS

A second tower of similar height and clearance and two others 460 feet each in



BEAUTY OF SYMMETRY and strength is shown in this final design for Tower No. 3 of the San Francisco-Oakland Bay Bridge. It will stand in the West channel 2300 feet off the San Francisco pier line. Drawn to scale the picture shows the S.S. Mariposa, with a total height of 145 feet, passing beneath the bridge deck with plenty of room to spare. The tower will be 505 feet high.

Highway Users Pay Largest Portion of Nation's Road Costs

ALTHOUGH property taxes are frequently credited with bearing most of the cost of building roads, the real burden is borne by motorists, an accurate survey of road costs shows, according to a recently published article by an authority on road matters.

"At present motorists are paying 94.5 per cent of the cost of building state highways and one-fourth of the cost of building local roads," says the article. "Altogether motorists are paying about two-thirds of the cost of building state and local highways.

"In 1930, the last year for which complete figures are obtainable, \$1,423,164,000 was available for state highway construction. But of that sum \$286,500,000 was left over from the previous year; Federal Aid contributed nearly \$92,500,000; bonds and notes financed by gasoline tax money accounted for \$22,288,000; miscellaneous income brought in \$17,000,000 and \$60,600,000 was transferred from local authorities for state highway construction.

PAYING THE MOST

"So the actual amount of money coming from tax sources is \$744,229,000. Of this only \$43,318,000 came from property and \$700,911,000 came from gasoline taxes and motor vehicle license fees. This latter amount is 94.5 per cent of the total from tax sources.

"In addition to paying nearly all of the costs of state roads, motorists are also paying one-fourth of the costs of building local roads. Tax sources in 1930 produced \$656,656,000 for local roads. Of that motorists paid \$162,022,000.

"For both local and state roads, tax sources paid \$1,400,884,000. Of that sum property taxes paid \$537,951,000 and motorists paid \$862,933,000, or approximately two-thirds.

"It is logical and reasonable that motorists pay nearly all of the cost of state roads and also fair that they should contribute in part to the improvement of local roads, say economists. At present motorists are paying a just share, the figures indicate. In general one-fourth of the income from gasoline taxes and motor license fees revert to local roads. This is coincidental with the traffic local roads carry—one-fourth of the nation's total is over the local roads."

PARK RECORDS INCREASE

National parks and monuments have steadily increased in popularity, according to reports by the United States Department of Parks. More than a quarter of a billion persons have visited these national playgrounds since 1916 and, with one exception during the world war, each succeeding year has shown a new record in number of visitors.

TO CURB SIGN VANDALS

Strong support to the campaign against vandals who wantonly destroy road signs erected for the guidance and protection of motorists has been signified by E. Raymond Cato, Chief of the California Highway Patrol. Cato has just issued an order enlisting the full force of the patrol in combating the sign vandal menace. Members of the patrol have been instructed to be on the alert for instances of sign destruction and to arrest the offenders.

Years Add Beauty to Capitol and its Wonder Park

WITH ITS dome towering high above its granite walls, the Capitol of California typifies the strength and beauty of an incomparable State. It stands like a fortress against the inroads of time, and so forward looking were the builders that even its massiveness has been made responsive to every modern service. The building was first planned in 1860—in fact, F. M. Butler, architect, was selected for the service only thirty-five days after the historic battle at Sumter.

The Capitol's tremendous weight, resting on foundations built under the handicaps of early day construction, have never surrendered one inch to the settling process, and today its firm lines are an object of admiration by modern builders. The cost of construction up to 1869 was \$2,600,000. Since that time alterations and changes have added many hundred thousand dollars to the cost.

MUSEUM OF TREES

Many states have buildings of which their people are proud, but no state has a capitol centered in a picture of such natural magnificence. Only in California is it possible to assemble the trees, the shrubbery and the flowers from the four quarters of the globe and have them flourish in their native beauty. There are 33.5 acres in the park; its various sections are a succession of wonders to those who love the beauties of an Eden. At the last count, there were 317 species of trees and shrubbery. The flowers cover the whole range of nature's floral laboratory. Trees have been brought from South America, from Australia, from Africa and the uttermost parts of the earth. Even the foothills of the Himalayas have been searched for varieties of cedar which grow to magnificent proportions under the gentle skies of California. It is an evergreen park. In summer it has its many bowers of shade, while in winter friendly sunshine plays upon unfading green.

BATTLEFIELD GROUP

One very interesting plot is that set aside for trees taken from the principal battlefields of the republic—a memorial sponsored by the ladies of the Grand Army of the Republic.

There are larger parks in the world; there are parks to which skilled landscape artists may have wrought more artificial wonders; but there is no other park in the world that provides such an exposition of natural wonders from all the continents and isles of the sea. The people of California are justly proud of this splendid property, which is open for their enjoyment and pleasure under most liberal rules.

The picture on the adjoining page shows the old Capitol as it stood on the terrace in 1875, and before the trees were even well started toward the magnificent size they have now attained. The lines look rather severe but they are honest and enduring lines and have been jealously preserved by the succeeding generation.

The second picture showing the Capitol and that portion of the park immediately surrounding it is a suggestion of the scene today.

Then there is the city kid who went to the country to see his grandmother for a visit and saw some ducks walking around and shouted, "Oh, granny, lookit the birds that just got out of a rumble seat!"

Time's Flight Pictured on Capitol Hill

1875



IN LONELY GRANDEUR the Capitol stood on its terraced hill, surrounded by a picket fence, a board sidewalk, a few shrubs and saplings when this picture was taken a year after completion.

1932



CAME THE AKRON on May 20, 1932, and looked down upon a Capitol surrounded by a beautiful thirty-three acre park filled with hundreds of giant trees and thousands of citizens and automobiles.

No Area to be Deprived of Water

(Continued from page 1)

mission, in accord with the recommendation of the Commission, to proceed to Washington, D. C., to make an appeal before the Board of Engineers for Rivers and Harbors on June 27 and 28, 1932, from the conclusions of the Division Engineer, Pacific Division, in his report to the War Department on the Sacramento-San Joaquin Valley project. At the hearing, the State Department of Public Works submitted a brief prepared by the Division of Water Resources.

The committee was authorized, also, to contact the proper Federal officials and to inform itself relative to the possibility and merits of financing California's water projects through the Reconstruction Finance Corporation.

On June 22d, following receipt of his Commission's report, the Governor invited the people of California to a meeting on July 11th at Oakland, for the purpose of obtaining the views of the people on the recommendations of the California Water Resources Commission and the California Joint Legislative Water Committee and on the advisability of calling a special session of the Legislature to consider and act upon the proposals of those two bodies so that any resulting legislation could be submitted to the vote of the people at the general election in November of this year.

GIVEN BIG JOB

The California Water Resources Commission was authorized by the 1931 Legislature in chapter 90, Statutes of 1931, and the Joint Legislative Water Committee in chapter 71 to study and report on the State Water Plan, and to prepare and submit such proposed legislation, resolutions and constitutional amendments as might be necessary and advisable to carry into effect a coordinated plan for the conservation, development and distribution of the water resources of the State.

In accord with this authorization, the California Water Resources Commission, consisting of nine citizens, and six State officials as ex officio members, was appointed by Governor Rolph, and the California Joint Legislative Water Committee, consisting of seven members of the Assembly and seven members of the Senate, was appointed by the Speaker of the Assembly and the President of the Senate, respectively. The latter body reported in April.

The report of Governor Rolph's Commission is comprehensive, treating all phases of the water problem of California, namely—engineering, economics, finances, legal and administrative. Appended to and part of the report are a proposed constitutional amendment, a proposed act for creating a permanent Water Resources Commission, and a proposed bond act for construction of the Central Valley project.

THIRTEEN RECOMMENDATIONS

The principal findings, conclusions and recommendations of the report are as follows:

(1) The State should now carefully formulate, adopt and carry out in an orderly manner, a comprehensive plan for the conservation, distribution and utilization of its available water resources.

(2) The engineering reports as prepared by the State Engineer are sufficient for the present for formulating a general program for a State Water Plan.

(3) No project should be constructed or encour-

aged at present looking to the development of any new lands.

(4) Each project constructed by the State should be self-sustaining and self-liquidating.

ALL AREAS PROTECTED

(5) The State in carrying out its water program should not at any time deprive any area of any water required for the full maintenance and development of such area.

(6) The State should, under proper safeguards, extend the aid of its credit to cities and districts in aid of financing water development, where such water is used in whole or in part for agricultural purposes.

(7) The State shall have power, and it is mandatory upon the Legislature, to levy and collect an ad valorem tax on all classes of property, with certain exemptions, within the exterior boundaries of a State agency, which has defaulted in its contract with the State.

(8) The creation of debts or liabilities of the State, contingent or otherwise, in carrying out a water program should be submitted to a vote of the people for their approval.

CENTRAL VALLEY PROJECT

(9) The construction of the Central Valley project should be undertaken by the State.

(10) The State should extend the benefit of its credit to the project of the Metropolitan Water District of Southern California, if such aid is requested.

(11) Every effort should be made to obtain cooperation and financial aid from the Federal Government for the development of the State's water resources.

(12) There should be created a permanent Water Resources Commission in order that there may be a proper and continued investigation of the water problems of the State, an orderly, well planned development of those resources and adequate administration of such water projects as are constructed by the State.

(13) A constitutional amendment, an act creating a permanent Water Commission and an act authorizing the construction of the Central Valley project should be adopted, not only to establish the fundamental principles upon which the State water program should proceed, but to enable a start to be made on the construction of that portion of the work which appears to be most urgently necessary.

MAJOR PROJECTS

The report treats of the engineering, economic, financial, legal and administrative elements of the problem in detail. The Central Valley project and the bringing of water from the Colorado River into the southern coast counties are recognized as of major importance demanding first consideration and action in any solution of the water problems of California.

These two projects by no means include all that will have to be done for the conservation of water in California as the years advance. "Many other areas of the State are facing increasingly difficult water situations and we reiterate that the need now is to lay out the fundamental principles of a

Aid Available for South on Request

(Continued from preceding page)

broad and comprehensive plan sufficient in scope to lend itself to the solution of those difficulties in an orderly manner. In no other way can the development of this State proceed in its expected course."

The Commission, after giving consideration to various financial plans, proposes financing the Central Valley project by issuance of general obligation bonds of the State, the total amount of bonded indebtedness to be reduced by whatever amounts are appropriated by the Federal Government in aid of the flood control,

substantial agreement in most of their findings and recommendations. Through cooperation and the medium of the joint sessions, certain fundamental principles were developed upon which to base the broad foundation of a state-wide water conservation program. Each has recommended that an amendment be made to the constitution of the State as the first step in carrying out such a program. The two proposed amendments are almost identical.

Four basic principles are incorporated in the proposed amendment. The first is a "pay-back" principle.



CALIFORNIA WATER RESOURCES COMMISSION members shown in the picture are, left to right, Edward Hyatt, State Engineer; D. K. Barnell, Merced; Harry L. Heffner, Los Angeles; Jesse Poundstone, Grimes; Shannon Crandall, Los Angeles, vice chairman; James M. Burke, Visalia; Governor James Rolph, Jr.; Hon. Matt I. Sullivan, San Francisco, chairman; A. B. Tarpey, Fresno; Francis Carr, Redding. Standing, A. M. Barton, chief engineer State Reclamation Board. Member not present, Commissioner R. C. Harbison of San Bernardino.

navigation and other features of the project. If adequate contributions from the Federal Government for these justified benefits can be secured, the Commission believes the Central Valley project can be made self-sustaining and self-liquidating, and recommends that the proper officers of the State and interested citizens pursue, vigorously and continuously, negotiations to secure the largest possible direct and other contributions from the Federal Government.

AID FOR SOUTH

Recognizing the bringing of water from the Colorado River into the southern coast counties as of state-wide importance, the Commission believes and recommends that should the Metropolitan Water District of Southern California request the State to underwrite or guarantee its bonds under the provisions of the proposed constitutional amendment, such request should be granted.

Both the Commission and the committee are in

No project shall be constructed until the State has firm contracts for the sale of water, power or other facilities from the project sufficient to pay back to the State within not more than seventy years all money expended for construction of the project, including interest, and all expense of operation, maintenance and making the necessary replacements. A further safeguard in case of default makes mandatory on the Legislature the levying and collection of an ad valorem tax on all property, with certain constitutional exemptions, within the entity contracting with the State.

TO HELP AGRICULTURE

The second principle is the loaning of credit of the State to State agencies, defined in the proposed constitutional amendment, as any county, city and county, municipality, or other public corporation or public district, to assist them in development and utilization of water resources which are used

(Continued on page 24)

Tetrahedrons Taming the Colorado to Prevent Flood Damage at Ehrenburg

THE DIVISION OF HIGHWAYS has recently completed additional protection work at the interstate bridge across the Colorado River near Ehrenburg. The project was financed jointly by California, Arizona, and the Palo Verde Irrigation District.

This bridge is the California gateway for transcontinental traffic over U. S. 60 from Phoenix, Arizona, via the Sunkist Trail and the Mecca-Blythe road. In addition, it carries much local traffic between Palos Verde Valley and neighboring Arizona points. The structure was built by a private corporation and opened to traffic in March, 1928. It was operated as a toll bridge for several years before the states of California and Arizona purchased it in 1931.

PIER UNDERMINED

During June, 1928, the flood waters of the Colorado undermined one of the piers, with the result that one span of the bridge collapsed and had to be rebuilt. It was reopened in March, 1929.

Some protection work along the banks was done at that time to hold the flood waters in the river channel and prevent scouring action. The Division of Highways began additional protection work early this year which was financed jointly by California, Arizona and the Palos Verde Irrigation District, the latter interested in limiting flood damage to lands in the district.

The work consisted of construction of tetrahedrons made up of railroad rail and fastened together with wire cable. At times of flood these obstacles catch the drift and thus obstruct the force of the current and cause gradual deposit of material at the critical point. This type of construction has been found a very effective and economical method of directing a stream in the desired channel when the deflectors are properly placed.

METHODS USED

Work of this character has been carried on during the past few years at many points when the State highways or bridge structures were endangered. The type of work depends, of course, on conditions.

A few of the measures taken are outlined briefly:

1. Tetrahedrons constructed either of reinforced concrete, or made up of railroad rail, as above.

2. Parallel rows of woven wire fencing. The rows are placed four feet apart, and the fencing is supported by galvanized pipe posts. These posts are driven ten to fifteen feet into the ground, and the fencing extends about three feet below the ground surface to insure against washing out. The space between the two rows is filled with brush weighted down with rock. This type of protection has been found effective where fairly shallow streams were eating into valuable land, or encroaching on highway right of way.

3. Where banks are too high to permit use of the fencing type, piles are driven and tied together with cable and barbed wire.

4. The use of sacked concrete has been found economical as slope protection at certain locations.

Other methods of protecting highway slopes and embankments from the gulleying effects of storm waters that the Highway Division has used with good success are:

1. Drainage of slide areas has been carried out successfully by using perforated metal pipe in ditches properly backfilled with graded rock.

2. In desert locations dips provided to carry off cloudburst overflow have been protected by extending the slope paving well below the surface. Dykes of proper design and in proper locations have materially reduced damage to the highways by diverting flood water to protected crossings.

It's a good thing, come to think about it, that graveled roads spread themselves out to more than just the main highways before we commenced paving or else we would be having to do a lot of driving on mud roads instead of over graveled detours, as we are able to do now when paving operations close a main route. And mud roads for the present-day driver are actually dangerous. Drivers in the days of all-dirt roads learned the advisability of going mighty slow on mud, but not so the driver of today who can't be comfortable at anything under 50 miles an hour. There could be things a lot worse than a good graveled detour.—*Crookston Daily Times*.



BEFORE TETRAHEDRONS were erected along the shoreline of the Colorado at Ehrenburg flood waters scoured away the west bank as shown in picture No. 1. The row of tetrahedrons seen in No. 2, by trapping drift flotsam and slowing up the current forces it to deposit banks of sand. No. 3 shows the protective barrier near the international bridge. The map indicates placement of tetrahedrons.

Rural Trucks Use Highways Most

(Continued from page 2)

cipally from the transportation of farm products. Other routes in the bay section carrying a large volume of trucking are those from Hayward to San Jose and Stockton, and Oakland to Sacramento.

HEAVIEST TRAVEL

In the Sacramento Valley important trucking routes radiate from Sacramento north to Marysville, southward to Stockton, and cities of the San Joaquin Valley, and southwest to Oakland and San Francisco.

U. S. No. 99 from Los Angeles through the San Joaquin Valley is the most heavily traveled route in the State, and the volume of truck traffic throughout this route is uniformly large.

In addition to long haul truck traffic between northern and southern California, there is a great deal of local trucking between cities of the densely populated San Joaquin Valley. From Bakersfield north to Stockton and the San Francisco Bay section the average daily volume of trucks varies from 400 immediately north of Bakersfield to more than 1000 at Fresno. In general, it may be stated that farm or their allied products constitute the majority of truck-hauled commodities.

TRUCK MILEAGE

The report indicates considerable variation in the daily mileage traveled by trucks, 75 per cent of all trucks traveling less than 140 miles per day, 90 per cent less than 200 miles per day with an average of 107 miles per day for all trucks. The daily average also varies for different routes, being 120 miles on U. S. No. 101 between Los Angeles and San Francisco, 135 miles on U. S. No. 80 between San Diego and Phoenix, Arizona, and 140 miles on U. S. No. 99 between Los Angeles and San Francisco.

These figures represent the arithmetic average. A median distance, which eliminates the undue effect of extremely long daily mileage by a few trucks, is more representative. This distance is 85 miles as compared to 107 miles above.

The following table shows the relative number of trucks of the various capacities observed on the State highways during the course of the survey and percentages.

Percentage Distribution of Trucks by Capacities Observed on California's State Highways

Capacity Group	Per cent
$\frac{1}{2}$ to $\frac{3}{4}$ tons.....	16.8
1 to $1\frac{1}{2}$ tons.....	41.8
2 to $2\frac{1}{2}$ tons.....	18.3
3 to $3\frac{1}{2}$ tons.....	9.7
4 to $4\frac{1}{2}$ tons.....	2.2
5 to $5\frac{1}{2}$ tons.....	4.5
6 to $6\frac{1}{2}$ tons.....	1.8
7 to $7\frac{1}{2}$ tons.....	.4
Over $7\frac{1}{2}$ tons.....	4.5
Total	100.0

Summary of Light and Heavy Trucks

Under 3 tons capacity.....	76.9 per cent
3 tons and over capacity.....	23.1 per cent
Total	100.0 per cent

HIGHWAY USE

The joint traffic survey has developed many interesting facts about our State highways, one of which is their use by various classes of motor vehicle owners. Vehicle ownership is divided into three classes—farm, village, and city, a city being a place of 2500 or greater population, and a village one of less than 2500 population. This division is identical with that of the United States Bureau of Census, except that cars of rural ownership are subdivided into owners living in rural communities, and those actually living on farms.

The following table would indicate that while the passenger vehicle use was proportional to the split in population, the rural-owned trucks on this same basis were enjoying a greater use of the State highways than the city-owned trucks:

Percentage Distribution According to Situs of Ownership

	Farm Owned	Village Owned	Combined Population	City Owned	Population
Trucks ---	16.7%	17.2%	26.7%	66.1%	73.3%
Passenger Vehicles	13.4%	13.4%	-----	73.2%	-----

Several factors affect the proportion of light and heavy trucks, the most important being the demand for type of goods. In general, goods which are transported by heavy trucks are mineral products, forest products and certain heavy industrial products. The transportation of furniture, fabricated steel, casing for oil wells and heavy

Foreign Traffic Has Minor Part in Daily Total of Mileage

(Continued from preceding page)

machinery are examples of the latter classification.

Farm products are usually transported to market by light trucks, and this is almost invariably the case where the truck is owned and operated by the farmer. However, there is a considerable movement of farm products in heavy trucks operated as "pickup" trucks by dairies, canneries, and packing companies.

On the basis of the survey data and figures it would appear that the movement of farm products in California is responsible for the heavier percentage of lighter capacity trucks.

FOREIGN TRUCK TRAFFIC

There is a considerable interstate movement of trucks, California contributing 47.5 per cent of Arizona's foreign truck traffic, 54 per cent of Nevada's, 29.2 per cent of Oregon's and 9.1 per cent of Washington's.

The makeup of some 86 per cent of California's foreign truck traffic is as follows:

Oregon	37.5%
Washington	11.3%
Arizona	7.8%
Nevada	7.0%
Northeastern States	13.9%
Central Plains States	8.7%

The range of foreign truck distribution is apparent from the fact that the survey shows a daily mileage of 181 miles for foreign trucks operating on California's State highways, as against a similar average of 106 miles for local trucks.

FOREIGN CAR TRAFFIC

Foreign traffic plays a relatively unimportant part in producing California's daily vehicle mileage, being responsible for but 4.9 per cent of our daily total. Out of a total of 411,600 foreign daily vehicle miles 71 per cent are produced by vehicles from west of the Mississippi River, 25 per cent from east of the Mississippi River and the remaining 4 per cent by machines from foreign states and counties.

As a matter of fact, California machines contribute 1.7 times as many vehicle miles in the 10 western states as we receive in the aggregate from all foreign sources. The extent of this visiting by Californians

LIGHTNING FLASH SETS OFF 15-SHOT BLAST

A rather unusual accident recently occurred in Fresno County Convict Camp No. 27. A series of 15 holes had been drilled and loaded, and wires had been fastened together and grounded, but had not been connected to the lead wires, nor was the battery anywhere near.

A severe thunder shower occurred and immediately following a flash of lightning the entire series of loaded holes exploded, set off by the lightning.

Fortunately nobody was in the immediate neighborhood and no injury was done to any person. However, this might have been a very serious accident, and indicates the need for care in blasting operations when thunder storms are threatening.

amounts to 692,400 daily vehicle miles or 7.7 per cent of the total daily vehicle miles traveled on our own State highways.

The following comparison measures the ratio of traffic exchange with our neighboring states:

The travel of California vehicles in Washington is 1.16 times that of Washington in California.

The travel of California vehicles in Oregon is 2.5 times that of Oregon in California.

The travel of California vehicles in Nevada is 4.0 times that of Nevada in California.

The travel of California vehicles in Arizona is 8.5 times that of Arizona in California.

An item of possible interest to Californians is the fact that our foreign daily vehicle mileage would be increased 23 per cent if the Central Plains states used our State highways to the same extent they do those of either Colorado, New Mexico or Nebraska.

The following basic statistics as set forth in the survey may offer a ready means of estimating the potential value of this foreign traffic.

The report shows that the average daily mileage for foreign vehicles is 247 miles, which is 65 per cent more than that of our State vehicles. To operate, this mileage will require 17 gallons of gasoline as the weighted average of both truck and passenger vehicle is 14.51 miles per gallon of gasoline. The number of visitors might safely be assumed at 2.27 per vehicle, which is the average number of occupants of passenger vehicles in California.

Conclusion: This digest of the joint survey as well as that of the preceding article in the May issue applies only to the State highways in which the data was gathered. The data itself is necessarily based on the laws of averages.

Portable Drilling Machine Developed For Bridge Foundation Investigations

By A. C. NORTH, Assistant Bridge Construction Engineer

A DESIGNER or a builder of bridges, no matter how great an artist or technician he may be, can never know that the product of his skill will successfully serve its purpose without an accurate determination of the material upon which the bridge is to be built.

In the Scriptures we read that rock was known to be a more satisfactory foundation material than sand, but no record has been found of any bearing value having been assigned to any other material, such as sandy clay saturated with water and full of small stones.

It is, therefore, with these more difficult materials that the present day foundation investigator is more deeply concerned in order that proper provision may be made for bridge foundations and the dollars spent for structures constitute a more lasting and secure investment.

FOUR GROUPS

Materials upon which bridges are built group themselves naturally under four classifications:

1. **Solid rocks which have a naturally high foundational value.**
2. **Softer rocks.** These may be of sedimentary origin or an alteration of harder rocks, to which a much lower bearing value should be assigned.
3. **Strata of comparatively recent sedimentary origin, whose natural bearing capacity must be determined and may have to be aided by driving piles into it.**
4. **Soft material which is not safe for bearing and requires that piles be driven through it to more solid material at an unknown depth.**

PROBLEMS INVOLVED

The first class offers few problems to the investigator other than the depth of the soft or decomposed material overlying it, so that the footings may be placed deep enough. The problems afforded by the second are greater than the first, as there may be caves and soft spots in it, or the material may disintegrate when exposed to water, air or sunlight. It is, however, the third and fourth classes which involve 90 per cent of the problems that confront the investigator.

It is necessary to assemble all the data

obtainable as to the consistency, texture and hardness of the earth and rock below the surface, so that the designer may determine the type of footing necessary to support the proposed structure.

It is economical and advisable, in large structures like the San Francisco Bay Bridge, to make very exhaustive and expensive studies of the material upon which such a large and costly bridge will rest, on account of the fact that the relative cost is small compared with the great loss that would result from a failure.

MANY INVESTIGATIONS

The multitude of small bridges, however, which constitute a large percentage of the structures undertaken each year by the Division of Highways present the same foundation problems in a lesser degree.

It is often found necessary to drill holes to a depth of as much as 50 feet into the ground at the bridge site, and bring the material to the surface for study. This requires a drilling machine driven by power, heavy enough to withstand hard usage, and still light enough to be transported easily at maximum speed. It must often be let down into rather inaccessible locations by a small operating crew.

The present Bridge Department Drill Rig, which is shown in the accompanying photos, is driven by a 3 h.p. air-cooled motor connected with a revolving gear wheel and has sufficient strength to twist an inch and a half water pipe in two. It furnishes the power to operate augers of a variety of shapes which penetrate the substrata and permit material to be withdrawn for study.

By means of a small hoist, at the back of the rig, a sand pump or a 450-pound churn drill can be used in sand or to test solid rock. When it is found desirable to line the hole to prevent caving, a 200-pound hammer, hoisted and dropped into a specially constructed driving head, is used to drive standard well casing.

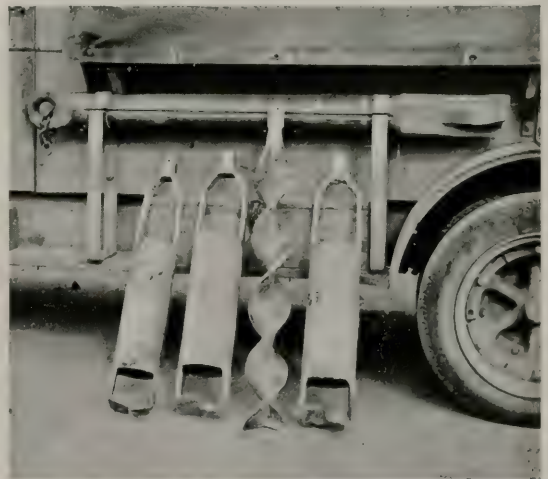
The rig is furnished with two wheels and can be fastened on to the rear of the survey party's truck as a trailer. When it is to be operated as a drill all that is necessary is to tip it up into a vertical position and start drilling.



QUICK ACTION is possible with this power drill rig for testing foundation materials at bridge sites. It is hauled to locations as a trailer by the survey party's truck. The machine was designed and developed by Assistant Construction Engineer A. C. North of the Bridge Department.



ON THE JOB, the trailer, up-ended operates as drill, sand pump or 200 pound trip-hammer hoist.



VERSATILE MACHINE operates these augers and drills.

TEXAS GOES COLLEGIATE

Automobile license plates for 1933 will be in collegiate colors, according to specifications of the State Highway Commission. Orange and white, University of Texas colors, have been selected for the plates. Texas A. & M. colors, red and white, were selected for truck license plates.—*Texas Highways*

"Bothered much by hitch-hikers when you're out riding?" "Not now. Tried a new plan. As soon as I get out of town I show the sign 'Taxi' on my car."—*Boston Transcript*.

Thirteen Road Jobs, Five Bridges on Advertising Program for the Month

1 1 1 1 1 1

C. H. PURCELL, State Highway Engineer for California, reported to Colonel Walter E. Garrison, Director of the Department of Public Works, that during the month of June the Division of Highways planned to advertise 18 major projects for construction on State highways at an estimated cost of \$3,600,000.

These projects include 13 road jobs and five bridges. The road projects cover work on approximately 71 miles of State highway, amounting to some \$3,000,000, and the proposed bridges are estimated to cost about \$600,000. The work is distributed well over the State and involves work in 13 counties.

The projects planned for advertising before July 1, in carrying forward the 1932 State highway construction program are as follows:

In Imperial County an important improvement is to be made to the interstate highway which enters California at Yuma. This project proposes the reconstruction of nearly eight miles of this highway between the easterly end of the Sand Hills to Araz Junction. The new road will be constructed parallel to the present oiled gravel road but on an improved alignment.

DEFIES STORM DAMAGE

The grade across the mesa, which is subject to cloudbursts, will be protected from storm damage by a series of dikes and ditches, similar to the construction used so successfully on desert highways in Riverside and San Bernardino counties. The project provides for placing a 20-foot asphalt concrete pavement.

The new pavement will connect at its easterly end with the recently completed pavement between Araz and Yuma. The completion of this pavement will provide motorists with a paved highway from El Centro to Yuma.

In San Diego County it is planned to advertise two projects between Rose Canyon and Sorrento Creek. These two projects are units in the State's share of the cooperative reconstruction of the entrance of the Coast Route into the city of San Diego. The work will comprise placing Portland cement con-

crete pavement and asphalt concrete pavement on the graded roadbed which has just been completed by the city of San Diego.

OBTAINES FAMOUS GRADE

The new highway connects with the Rose Canyon cut-off and will provide two one-way 20-foot pavements to the Torrey Pines reservoir. The existing pavement is to be widened to 20 feet and a new asphalt concrete pavement 20 feet wide is to be placed on the new grade which was constructed easterly of the existing highway. From the reservoir the highway will be on a new alignment into Sorrento Canyon which will obviate the use of the notorious Torrey Pines grade. This section of new pavement will be of Portland cement concrete 30 feet wide.

An improvement to the popular highway, known as the Crest Road which connects San Bernardino with the scenic recreational region around Lake Arrowhead and Big Bear Lake, is to be made between Camp Waterman and the entrance to Waterman Canyon near Arrowhead Springs station. This project involves the reconstruction of 4.5 miles of road and includes drastic improvements to both line and grade.

The new alignment will be in keeping with modern standards of mountain highway construction and the maximum gradient on the new road will be 6.4 per cent as against the 20 per cent maximum on the existing road. The project calls for a bituminous treated crushed rock surface 20 feet wide and will connect with the two miles of new highway constructed two years ago from the pass between Waterman Canyon and Devil's Canyon to Camp Waterman.

IN SECONDARY SYSTEM

One of the projects which mark the beginning of work on the secondary highways incorporated in the State road system by the last Legislature is an improvement to the Pomona-Fullerton road from Pomona to Brea Canyon in Los Angeles County. This project provides for the construction of a new highway from Fifth Street at the westerly city limits of Pomona to a connection with the Brea Canyon road northerly of the head of the canyon.

Work Planned for Bids in June

Projects scheduled by the Division of Highways to be advertised for bids prior to July 1, included eighteen major projects in thirteen counties. The proposed work comprised 71 miles of State highway and five bridges at an estimated total cost of \$3,618,300 as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type
San Diego	Rose Canyon to Sorrento Creek	4.4	P. C. C. Pave.
San Mateo	South of South San Francisco	0.6	P. C. C. Pave.
Los Angeles	Barranca St. to Pomona	6.0	P. C. C. Pave.
Alameda	Castro Hill to Stanton Ave.	2.4	P. C. C. Pave.
Los Angeles	Brea Canyon to Pomona	6.2	P. C. C. Pave.
San Diego	Rose Canyon to Torrey Pines Reservoir	2.1	Asph't Con. Pave.
Imperial	Sand Hills to Araz Junction	7.9	Asph't Con. Pave.
San Bernardino	Halloran Summit to Mountain Pass	16.5	B. T. Cr. Rk. Surf.
Amador	Amador City to Martell	4.8	B. T. Cr. Rk. Surf.
Shasta	Canyon Creek to Hat Creek Summit	10.2	B. T. Cr. Rk. Surf.
San Bernardino	Camp Waterman to Waterman Canyon	4.5	B. T. Cr. Rk. Surf.
Mendocino	Little Dann Creek to Stacey's Place	1.6	Untr. C. Rk. Surf.
Monterey	San Remo Divide to Carmel River	3.7	Graded Roadbed
Monterey	Across Wild Cat Creek		Stone-faced Arch
San Joaquin- Stanislaus	Across Stanislaus River		Conc. and Steel
San Joaquin	Across Paradise Cut		Steel Stringer
Ventura	Across Ventura River		R. C. Girder
San Diego	Across Tracks of A. T. & S. F. Ry. at Sorrento Canyon		R. C. Gir. Overhd.

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement.....	19.6	\$1,076,500
Asphalt Concrete Pavement.....	10.0	458,900
Bituminous Treated Crushed Rock Surfacing	36.0	1,180,200
Untreated Crushed Rock Surfacing.....	1.6	74,600
Graded Roadbed.....	3.7	176,600
Bridges	(5)	651,500
Totals	70.9	\$3,618,300

Final Link of Waterman Canyon Improvement Eliminates Switchbacks

By E. Q. SULLIVAN, District Engineer

SOON to be constructed is the final section of the State highway which will link with a high gear road, the San Bernardino Valley, and the San Bernardino Mountains—a play ground for all of southern California.

This final link will eliminate completely the treacherous old "switchbacks" which offer grades as steep as 22 per cent. The new section begins at the Indian Archway which marks the entrance to the world-famed Arrowhead Hotel Hot Springs and extends to Camp Waterman, where it joins the high gear road completed last year.

The present road was constructed in 1901 by the Arrowhead Reservoir and Power Company for the purpose of hauling up materials for the construction of the dam which now forms beautiful Lake Arrowhead. It was a toll road chartered by the county and closely followed the route of the historic old Mormon lumber road constructed in 1851.

PIONEER HISTORY

The accounts of the old Mormon lumber road, taken from letters written home to Salt Lake City, describe the efforts of the pioneers. After the first buildings were constructed in San Bernardino of willow and cottonwood, to temporarily house the settlers, it was decided that lumber of better quality from the mountains was needed. The Mormons also hoped to establish a profitable trade in producing lumber for the Los Angeles market.

After the first harvests were gathered, it is recorded that all able bodied men were called together to participate in the building of the road to the mountain forests. One thousand days' labor was required to complete the task. Saw mills were installed in the valley.

So steep was this old lumber road and so heavily loaded with logs were the clumsy wagons, that trees were dragged behind the wagons to serve as additional brakes. The place can still be pointed out where these trees were untied from behind the wagons—the "Drag Yard" it was called, for the settlers soon learned to come to saw these drag trees into fire wood, and the place became a community center of activity.

The new State highway location will not follow closely the old location along the

Waterman Creek stream bed, but will follow along the west wall of the canyon to avoid the steep grades and sharp curves of the old toll road.

From an elevation of 1850 feet at the start, the new highway, together with the upper portions finally climbs to an elevation of over 7000 feet with ever changing magnificent views of the entire valley. Snow capped peaks rise in the distance and the valley floors look like a geometric pattern with cities, orange groves, and farms in panorama.

On some exceptionally clear days the great metropolitan area of Los Angeles can be seen with the Pacific Ocean and Catalina Island in the distance.

The most timid driver will have easy access via the new State highway to the vast mountain playgrounds including the Crestline district, the Los Angeles city park, the exclusive Arrowhead district, and the many resorts along the mountain crest to the popular Big Bear Lake region. There are also thousands of private mountain homes along the highway.

MECCA FOR MOTORISTS

The bright sun and cool breezes of the high altitudes, the pine trees, and mountain vegetation with views of both the desert on the north and cultivated valleys on the south, and the highly developed playground facilities make this region a mecca for all persons.

This final highway link is 4½ miles long. It will have a roadbed 24 feet in width, surfaced with oiled mixed material.

The State budget provides \$650,000 for this project, but in view of the decreasing costs since the budget was formulated, it is possible that the cost will be less.

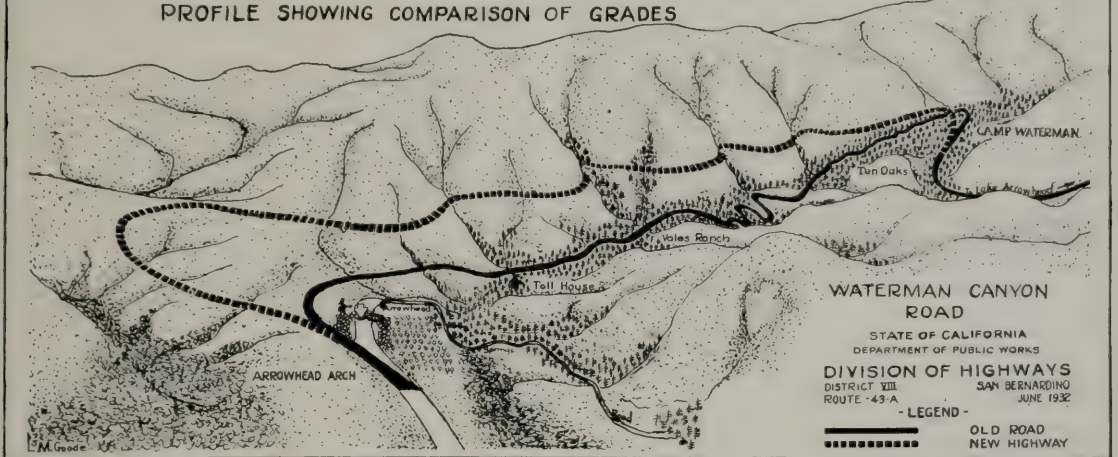
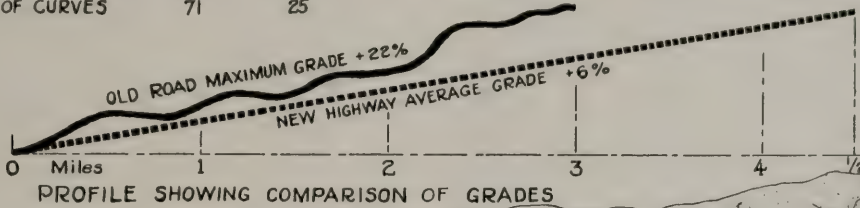
QUITE A ROADWAY

A wealthy New Yorker the other day suggested the construction of an eight-billion-dollar toll highway across the United States. His highway would be 500 feet wide, from coast to coast. It would have 10 traffic lanes in each direction, with the speed limits on certain lanes ranging up to 100 miles an hour. It would be lined with 300 modern hotels and tourist camps, and what with one thing and another it would be quite a roadway.

Wife (on their return from the party): "Do you realize what you did?"
Husband: "No; but I'll admit it was wrong. What was it?"—*Borrow Pit*

Steep Grades, 45 Curves Abolished

	OLD ROAD	NEW HIGHWAY
LENGTH IN MILES	3	4½
MAXIMUM GRADE	+22%	+6.4%
MINIMUM RADIUS CURVE	25'	250'
NUMBER OF CURVES	71	25



YOU TAKE THE HIGH ROAD up Waterman Canyon to the Rim o' the World and Lake Arrowhead areas when this last link of the high gear State highway route is completed leading to the San Bernadino Mountain resorts. It eliminates the steep switchbacks on the old Mormon trail route as shown in this revealing sketch map by draftsman Maynard Goode of District VIII headquarters staff.



OUT OF THE DEEP canyon bottom along Waterman Creek, the new route will take the highway far up along the slopes of the foothills to a final elevation of 7000 feet on the upper portion. The white lines indicate the course of the new location and a glimpse of the present road in the canyon below is caught by the camera.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 JUNE, 1932 No. 6

PROFITABLE INVESTMENT

Good roads are a good investment.

How very good may be seen in the fact that, based on a saving of one and one-quarter cents per mile in reduced fuel and motor vehicle operating costs, California's State highways, up to June 30, 1930, after deducting all maintenance, interest and depreciation charges, earned \$54,000,000 on a capital investment of \$172,000,000.

Dollar for dollar, what constructive enterprise in the country can make a better showing?

But these figures, as taken from the current issue of California Highways and Public Works, official organ of the State Department of Public Works, tell only a part of the story.

They do not include the tourist income so largely increased by the publicity given to our network of smooth, broad State highways, which are themselves an additional attraction to the scenic beauties of California.

Good roads are good tourist business, which means good business for everybody.

The more smooth highways the more holiday visitors, and the visiting vacationist pays ready cash.

In southern California in the year 1928-29 he spent no less than \$317,000,000.

In 1930 in the ten southern California counties he paid State gasoline tax to the tune of \$3,196,000.

But for our good roads he would have come as an explorer or as single spies.

With good roads he comes in whole battalions.

They are a good investment.—*Los Angeles Examiner.*

It is said that the automobile is wrecking the younger generation; maybe so, but what is the younger generation doing to the automobile?

870,000 Employed by Highway Work in 1931

"That public work, such as road building, is one of the best ways for the country to furnish employment is shown in the actual employment figures in 1931," declares W. C. Markham, Executive Secretary of the American Association of State Highway Officials.

"An average of approximately 290,000 men had road jobs on Federal Aid and State projects during 1931," Mr. Markham asserts. "It is conceded by those who have studied the subject that for every man working directly on the roads there is employment given two men who are preparing or transporting materials."

On that basis the Federal Aid and State work alone was responsible for the employment of an average of 870,000 men throughout 1931. Local road work and street building brings the total number of men employed, directly and indirectly, in the improvement of automobile facilities to well over two million workers.

"To furnish work it is not necessary to avoid the use of machinery," Mr. Markham says. "While it is true that the highest proportion of manual labor is found in hand-labor projects, it is also true that about nine-tenths of the road money spent for high type pavements also goes to labor. This is so because no intrinsically valuable materials go into roads; the hand of labor plays the major part in preparing these materials, in building equipment and in transporting these supplies to the project.

"The Federal government, the State and the local community can feel that when it makes a dollar available to road construction that it will be a dollar well spent, a dollar invested mostly in labor."

FIRST METAL BRIDGE

America's first metal bridge, built a century ago, is still in use, according to the U. S. Army Recruiting News.

The bridge was erected by Army engineers over Dunlop Creek, near Brownsville, Pennsylvania, during the building of the old "Cumberland Road," also called the "National Turnpike." It is of cast iron tubular construction.

The structure has carried traffic for 83 years. During the flourishing days of the Cumberland Road stage coaches and Conestoga wagons rumbled over it in a constant stream. Then for a half century the road was little used. Now again an endless procession of automobiles and trucks pass over the bridge at greater speeds and carrying greater loads than the Army designer ever dreamed of its being subjected to. And in addition to these impact loads, the old bridge is being subjected to a dead load consisting of two 5'-10" concrete sidewalks.—*New Mexico.*



OLD AND NEW methods of extracting drill steel stuck in the hole are shown above. The old, lengthy and laborious sledge-hammer method has been eliminated by the Jumbo steel puller invented by Camp Superintendent Edward Rawson.

Highway Camp Chief Invents an Improved Drill Steel Puller

By C. S. POPE, Construction Engineer

SUPERINTENDENT EDWARD RAWSON, in charge of the convict camp at West Branch, east of Oroville in Butte County, has invented an improved device for pulling out drill steel that becomes stuck in the hole when drilling for blasting operations in rock formations on highway work.

Heretofore, whenever the drill steel stuck, the usual procedure to dislodge it was by means of a steel goose neck and sledge hammer, a method which often proved inefficient and wasteful of time, labor and material, some times requiring several hours time, or the loss of both drill and hole. Since the progress of each highway construction crew is dependent on the work of a preceding unit, whenever the drill crew is held up by stuck steel, the progress of the entire job may be delayed.

QUICK AND EASY

The Jumbo drill steel puller devised by Mr. Rawson has eliminated this excessive and expensive waste, and reduced a trying task to a few minutes work. It consists essentially of a clamping block, a fulcrum chair, and a forked lever, all of cast steel. The operation of the device is as follows: The fulcrum chair is set in position circling the stuck drill, the clamping block is fixed to the steel, and pulling pressure is applied to the arms of the clamping block by means of the forked lever resting on the fulcrum chair.



A CLOSE-UP of Jumbo steel drill puller showing clamping block, fulcrum chair and forked lever.

Drill steel is seldom stuck for a distance greater than two feet, and the average time required for setting up the steel puller and lifting the steel is from five to ten minutes. The machine is strong and compact and has been thoroughly tested out and used successfully on State highway construction work.

An automobile traveling at 60 miles per hour has the same capacity for inflicting damage that the same automobile would have if it were driven off a ten-story building, 120 feet high.—*Maine Highways*.

Murphy: "What's that in your pocket?"

Pat (in whisper): "Dynamite. I'm waiting for Casey. Every time he meets me he slaps me on the chest and breaks me pipe. Next time he does it, he'll blow his hand off."—*The Earth Mover*.

Water Law Changes Unnecessary

(Continued from page 11)

or to be used, in whole or in substantial part for agricultural purposes.

The loaning of the credit of the State for such water projects would be safeguarded by a provision in the proposed constitutional amendment that each particular project must first receive the approval and recommendation of the proposed permanent Water Commission and be passed by the Legislature before submission to the vote of the people. The safeguard of requiring the levy and collection of an ad valorem tax in case of default is provided for in loaning of credit of the State.

The third principle is the prohibiting of the taking of water by the State under any project constructed by the State itself, from any area where such water is required for the full maintenance and development of that area.

The fourth principle is the requirement that all debts or liabilities of the State, contingent or otherwise, created under the provisions of this amendment, must first be voted upon and approved by the people as provided in section 1 of Article XVI of the Constitution.

EMBODIES BASIC PRINCIPLES

The Commission states in regard to the constitutional amendment that:

"We believe that this constitutional amendment embodies fundamental principles which are necessary to be written into the constitution of the State as a firm foundation for the future development of a State water program. It contains what we believe are necessary limitations and safeguards to provide against unsafe or unwise expenditure of public moneys upon projects which will not be self-sustaining and self-liquidating; and it further provides adequate protection to areas having surplus water, that they will always be assured by the State of a supply of water adequate for their complete development. Moreover, this constitutional amendment provides for the possibility of cooperation between the State and Federal governments in the construction of water projects."

The Commission recommends that any project constructed under present economic agricultural conditions should be designed for the preservation and maintenance of improved lands, threatened with destruction or great damage through a deficient water supply. There should be no development of new lands and rigid safeguards in investigation and administration should be adopted and enforced to insure this condition.

GREAT ENTERPRISE

The Commission recommends the creation of a permanent Water Resources Commission as the proper governmental machinery for administration of a statewide water program, and submits a proposed form of act to create such commission. "The duty of such Commission will be to investigate and recommend projects, recommend plans of financing them, negotiate and arrange all contracts with reference to them, and generally supervise their construction and operation.

"A State water program if carried out will be a great business enterprise. It can only be successfully conducted by well qualified men giving it constant attention. Moreover, if the development of a State plan is to be progressive and compre-

hensive, as we believe it must be, then it should receive continuous investigation and planning."

A form of act authorizing the construction of the Central Valley project, after approval of a bond issue by the people and the obtaining of the necessary contracts to make it self-sustaining and self-liquidating in accordance with the proposed constitutional amendment, is attached to and made a part of the report. It is recommended for adoption.

NO SPECIAL COURT

In regard to the creation of a special court or tribunal with exclusive jurisdiction to hear and determine controversies as to water rights, the Commission states in its report:

"We have carefully considered this suggestion. A majority of the members of this Commission are of the opinion that no necessity exists for the creation of such court or tribunal and that it is not advisable to authorize its creation. It is believed that our courts, as at present constituted, are capable and best qualified to continue adjudicating water rights.

"Nor do we recommend any changes in the present law of waters. Such changes, either substantive or procedural as experience may demonstrate to be necessary to carry out a State water plan, may and should be left to future legislatures."

COMMISSION MEMBERS

The membership of the Commission is:

Hon. Matt I. Sullivan, chairman, San Francisco.
Shannon Crandall, vice chairman, Los Angeles.
D. K. Barnell, Merced.
James M. Burke, Visalia.
Francis Carr, Redding.
R. C. Harbison, San Bernardino.
Harry L. Heffner, Los Angeles.
W. B. Mathews,* Los Angeles.
Jesse Poundstone, Grimes.
A. B. Tarpey, Fresno.

Ex officio members to aid Commission:

A. M. Barton, Chief Engineer, State Reclamation Board.
Walter E. Garrison, Director of Public Works.
Edward Hyatt, Secretary, State Engineer.
Edward Rainey, Superintendent of Banks.
Rolland A. Vandegrift, Director of Finance.
U. S. Webb, Attorney General.

LEGISLATIVE COMMITTEE

The California Joint Legislative Water Committee met and organized on July 3, 1931. It has worked diligently on a solution of the problem, studying all the legislative reports, reports of the Division of Water Resources, State Department of Public Works and of the Federal Government. The committee has held many public hearings and cooperated and collaborated with the California Water Resources Commission. Further, it met with the subcommittee of the U. S. House of Representatives Appropriation Committee, dealing with appropriations for the Department of Interior.

* Commissioner Mathews died December 9, 1931. Harry L. Heffner appointed Commissioner by Governor Rolph on January 21, 1932, to fill the vacancy.

Joint Committee Report in Accord

(Continued from preceding page)

The membership of the committee is:

Senator B. S. Crittenden, chairman, Stockton, San Joaquin County.

Assemblyman Robert P. Easley, vice chairman, Antioch, Contra Costa County.

Assemblyman Robert L. Patterson, secretary, Bakersfield, Kern County.

Senator C. C. Baker, Salinas, Monterey County.

Senator Ralph H. Clock, Long Beach, Los Angeles County.

Senator Frank W. Mixter, Exeter, Tulare County.

a State coordinated water conservation plan," certain definite recommendations have been made in its report.

FAVOR AMENDMENT

Recommendation No. 1. That the initial step should be a general constitutional amendment authorizing the Legislature to enact such legislation as may be necessary in carrying out a comprehensive state-wide water program and the amendment, general in form, as recommended should be submitted by the Legislature to the people of the State.



JOINT LEGISLATIVE WATER COMMITTEE members shown in the picture are: front row from left to right, Assemblyman Edward Craig, Assemblyman Chester M. Kline, Senator B. S. Crittenden, chairman; Assemblyman Harold C. Cloudman, Assemblyman Robert L. Patterson. In the back row, left to right, are Senator C. C. Baker, Senator Frank W. Mixter, Assemblyman Robert P. Easley, Joe Nolan, sergeant-at-arms; Assemblyman Frank S. Israel, Senator Andrew R. Schottky.

Senator W. P. Rich, Marysville, Yuba County.

Senator Andrew R. Schottky, Merced, Merced County.

Senator Ralph E. Swing, San Bernardino, San Bernardino County.

Assemblyman Harold C. Cloudman, Berkeley, Alameda County.

Assemblyman Edward Craig, Brea, Orange County.

Assemblyman John E. Frazier, Gridley, Butte County.

Assemblyman Frank S. Israel, Linden, San Joaquin County.

Assemblyman Chester M. Kline, San Jacinto, Riverside County.

The committee concluded its studies and filed a report with the President of the Senate and the Speaker of the Assembly on April 20, 1932.

In accord with the views of the Committee that "its primary duty was to consider and report upon legislation which would enable the State to carry out

Recommendation No. 2. That the general constitutional amendment, as recommended, be adopted and that if the Governor deems it advisable, a special session of the Legislature be called, in order that the proposed amendment may be placed on the ballot at the general election to be held in 1932.

Recommendation No. 3. That in event the Governor should elect to call the Legislature into special session, with respect to the water conservation question, his call for such special session be sufficiently broad in scope so as to permit of legislation for the submission to the vote of the people of a bond act for the construction of the great Central Valley project.

The constitutional amendment proposed and recommended by the Legislative Committee for adoption is in accord and practically identical with that recommended by the California Water Resources Commission. This desirable and favorable result was effected through the medium of many joint sessions and subcommittee meetings of the two bodies.

(Continued on page 36)

Highway Bids and Awards for May

BUTTE COUNTY—District II, Route 21, between Pulga and Cresta about 4.2 miles to be graded. Force Const. Co. and C. T. Malcom, Piedmont and Walnut Creek, \$447,664.25; Morrison Knudsen Co., Los Angeles, \$429,910; McDonald, Inc., San Francisco, \$365,247.50; Kern & Kibbe, Portland, Oregon, \$309,262.50; Von der Hellen & Pierson, Castaic, \$351,187.50; Haas Doughty & Jones, San Francisco, \$599,117.50; Meyer Rosenberg, San Francisco, \$319,102.50; Utah Construction Co., San Francisco, \$320,989; Mittry Bros. Const. Co., Los Angeles, \$317,314; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$330,829.50; Frederickson & Watson Const. Co. & Frederickson Bros., Oakland, \$307,987.50; Geo. Pollock Co., Sacramento, \$369,322; Clark & Henery Const. Co., San Francisco, \$379,953.25. Contract awarded to Hemstreet & Bell, Marysville, \$297,509.25.

CALAVERAS AND ALPINE COUNTIES—District X, Route 24, between Big Trees and Lake Alpine, about 20.2 miles in length to be treated with fuel oil as a dust palliative. C. W. Wood, Stockton, \$4,699.50; A. Teichert & Sons, Inc., Sacramento, \$4,680; Basalt Rock Co., Inc., Napa, \$4,290; A. Mitchell, Sacramento, \$5,409.50; Edw. A. Peres, Richmond, \$4,223; Tiffany-McReynolds-Tiffany, San Jose, \$4,610. Contract awarded to Consumers Oil Co., Los Angeles, \$3,787.

HUMBOLDT AND TRINITY COUNTIES—District I, Route 20, dust oiling between Blue Lake and Salyer, about 30 miles in length. A. Teichert & Son, Inc., Sacramento, \$8,013.50. Contract awarded to Skeels & Graham Co., Roseville, \$7,341.40.

KERN COUNTY—District IX, Route 57, between Weldon and junction of routes 57 and 23 near Freeman, about 30.7 miles of existing roadbed to be treated with asphaltic road oil as dust palliative. Fred W. Nighbert, Bakersfield, \$12,600; John Jurkovich, Fresno, \$14,700; J. G. Donovan & Son, Los Angeles, \$15,050; C. A. Ladeveze, Los Angeles, \$14,000; Pacific Tank Lines, Inc., Los Angeles, \$15,680; Paulson & March, Inc., Los Angeles, \$13,580; Clyde W. Wood, Stockton, \$14,700; Stewart & Nuss, Inc., Fresno, \$13,090. Contract awarded to Oilfields Trucking Co., Taft, \$11,970.

KERN COUNTY—District VI, Route 4, between Grapevine Station and Bakersfield, 22 miles of asphalt concrete surface to be planed. Standard Road Planing Co., Los Angeles, \$21,516.71. Contract rejected.

KERN COUNTY—District VI, Route 58, between junction of Arvin road and west city limits of Tehachapi, about 19.5 miles of dust oiling. Oilfields Trucking Co., Taft, \$10,834.20; Fred W. Nighbert, Bakersfield, \$10,880.50; Hartman Construction Co., Bakersfield, \$10,417.50; Consumers Oil Co., Los Angeles, \$11,621.30; John Jurkovich, Fresno, \$9,908.20. Contract awarded to Granite Construction Co., Ltd., Watsonville, \$8,843.30.

KERN COUNTY—District VI, Route 57, between Democrat Springs and Weldon, about 30.6 miles of dust oiling. Stewart & Nuss, Inc., Fresno, \$12,541.95; Oilfields Trucking Co., Taft, \$10,617.30; Granite Construction Co., Ltd., Watsonville, \$12,140.10; Fred W. Nighbert, Bakersfield, \$11,632.50; Hartman Construction Co., Bakersfield, \$14,805; Consumers Oil Co., Los Angeles, \$12,605.40. Contract awarded to Street Improvement Co., Los Angeles, \$8,037.

LOS ANGELES COUNTY—District VII, Route 4, at points between 4 and 8 miles south of Gorman Station, construct 3 bridges. Byerts & Dunn, Los Angeles, \$62,109.50; Lynch Cannon Engineering Co., Los Angeles, \$56,572.50; Morrison Knudsen Co. & MacDonald & Kahn Co., Ltd., San Francisco, \$54,768.10; Oberg Bros., Los Angeles, \$61,997. Contract awarded to Dimmitt & Taylor, Los Angeles, \$47,458.25.

MENDOCINO COUNTY—District IV, Route 48, furnish and apply light fuel oil to portions of the roadbed between McDonald and Flynn Creek, as a dust palliative, about 15 miles. C. F. Frederickson & Sons, Lower Lake, \$4,280; Edw. A. Peres, Richmond, \$3,640; Basalt Rock Co., Inc., Napa, \$3,760. Contract awarded to Chas. Kuppinger, Lakeport, \$3,600.

MONO COUNTY—District IX, Route 23, between foot Conway Grade and 2 miles west of Bridgeport, about 18.3 miles treat existing road with fuel oil. Oilfields Trucking Co., Taft, \$19,668.75; George Herz & Co., San Bernardino, \$21,189.80; C. A. Ladeveze, Los Angeles, \$22,973.10; Southwest Paving Co., Los Angeles, \$25,333.35; Clyde W. Wood, Stockton, \$22,-

553.50. Contract awarded to Basalt Rock Co., Inc., Napa, \$18,777.10.

ORANGE AND LOS ANGELES COUNTIES—District VII, Routes 43, 60, between Newport and Orange-Riverside Co. line; between Long Beach and Seal Beach and at Lomita, about 24.9 miles treat earth shoulders with fuel oil. Sander Pearson, Santa Monica, \$19,628; Southwest Paving Co., Los Angeles, \$13,669.50; Oilfield Trucking Co., Taft, \$15,702.40; C. A. Ladeveze, Los Angeles, \$16,683.80. Contract awarded to Martin Bros. Trucking Co., Long Beach, \$12,057.20.

ORANGE COUNTY—District VII, Route 2, moving and altering 13 buildings in Doheny Park. E. W. Smith, Santa Ana, \$9,492; Clark & Campbell, Los Angeles, \$12,500; E. G. Bowen & Co., Ltd., Los Angeles, \$14,517. Contract awarded to Harry Friedman, Los Angeles, \$9,455.

ORANGE COUNTY—District VII, Route 60, between Laguna Beach and Dana Point, about 4.9 miles to be graded and paved with P. C. concrete. Mittry Bros. Const. Co., Los Angeles, \$311,991.40; Jahn & Bressi Construction Co., Inc., Los Angeles, \$289,577.75; Sander Pearson and Dimmitt & Taylor, Los Angeles, \$336,516.25; Sharp and Fellows Contracting Co., Los Angeles, \$324,922.30; Griffith Company, Los Angeles, \$283,587.50; Frederickson & Watson Construction Co., Frederickson Bros., Oakland, \$302,185.75; United Concrete Pipe Corporation, Los Angeles, \$316,166.65. Contract awarded to Daley Corporation, San Diego, \$282,681.80.

ORANGE COUNTY—District VII, Route 2, moving and altering 13 buildings in Doheny Park. Harry Friedman, Los Angeles, \$9,455; E. W. Smith, Santa Ana, \$9,492; Clark & Campbell, Los Angeles, \$12,500; E. G. Bowen & Co., Ltd., Los Angeles, \$14,517. Contract rejected.

PLUMAS COUNTY—District II, Route 21, reinforced concrete girder bridge across Western Pacific R. R. tunnel near Keddie. Whited and Whited, Santa Rosa, \$2,477; J. P. Brennan, Redding, \$2,649; Rolla Arbuckle, Anderson, \$2,845; Chigris & Sutsos, San Francisco, \$2,882.50; John Burlinger, Orland, \$3,655; J. W. Halterman, Willows, \$3,718.50. Contract awarded to F. H. Nielson, Orland, \$2,237.40.

PLUMAS AND LASSEN COUNTIES—District II, Route 21, furnishing and applying fuel oil on portions of State highway in Plumas County and Lassen County, between Delleker and a junction with State highway route 29, near Chat. Skeels & Graham Co., Roseville, \$8,712. Contract awarded to Basalt Rock Co., Inc., Napa, \$8,712.

SACRAMENTO COUNTY—District X, Route 4, between McConnell and Sacramento, about 11.9 miles to be graded and existing rock borders to be bit. surf. treated. Clyde W. Wood, Stockton, \$103,462.65; Frederickson & Watson Construction Co., Frederickson Bros., Oakland, \$118,379.65; A. Teichert & Son, Inc., Sacramento, \$121,346.35; Hemstreet & Bell, Marysville, \$136,396.45; M. J. Bevanda, Stockton, \$120,699.80; Hanrahan Company, San Francisco, \$116,234.20; S. H. Palmer and J. P. Holland, Inc., San Francisco, \$150,688.10; J. R. Reeves and Lord & Bishop, Sacramento, \$105,400.40; L. G. Kipp, Sacramento, \$117,703.25; Bundeson and Lauritzen and Delta Dredging Co., Pittsburg, \$121,235. Contract awarded to Force Construction Co., Piedmont, \$102,985.30.

SAN BERNARDINO COUNTY—District VIII, at District VIII headquarters, San Bernardino, the erection and completion of an addition to the District Office Building. Martin Green, San Bernardino, \$4,379. Contract awarded to Bakker and Robinson, San Bernardino, \$3,739.

SAN DIEGO AND IMPERIAL COUNTIES—District VII, Routes 12, D, E, F, 12-H, 12-A, 2-F, 47.3 miles shoulders to be treated with fuel oil; 0.9 miles seal coat to be applied. Miracle Co. (O. U. Miracle), San Diego, \$22,553; V. R. Dennis Const. Co., San Diego, \$25,959. Contract awarded to R. E. Hazard Contracting Co., San Diego, \$10,732.

SAN DIEGO COUNTY—District VII, Route 77, between San Diego and San Diego-Riverside County line, about 60.2 miles, treat earth shoulders with fuel oil. Miracle Company, San Diego, \$37,469.90; Oilfields Trucking Company, Taft, \$43,537.90; R. E. Hazard Contracting Co., San Diego, \$32,463.80; Clyde

Extensive Highway Oiling Contracts Among May Awards

(Continued from preceding page)

W. Wood, Stockton, \$50,819.50; Martin Bros. Trucking Co., Long Beach, \$41,717.50. Contract awarded to Southwest Paving Company, Los Angeles, \$30,188.30.

SAN LUIS OBISPO COUNTY—District V, Route 56, between San Luis Obispo and Morro, about 11.8 miles to be treated with heavy fuel oil on each side of existing pavement. Oilfields Trucking Co., Taft, \$7,557; Walter B. Roselip, San Luis Obispo, \$6,831; Santa Maria Construction Co., Santa Maria, \$6,055; Granite Construction Co., Ltd., Watsonville, \$5,973; Tiffany-McReynolds-Tiffany, San Jose, \$6,435. Contract awarded to Stewart & Nuss, Inc., Fresno, \$5,874.

SAN MATEO COUNTY—District IV, Route 68, between San Mateo and Redwood City, about 7.3 miles to be surfaced with bituminous treated crushed gravel or stone. Fred W. Nighbert, Bakersfield, \$134,003.10; Union Paving Co., San Francisco, \$136,026.50; A. Teichert & Son, Inc., Sacramento, \$169,046.50; Jack Casson, Hayward, \$147,756; C. W. Wood, Stockton, \$161,718; Granite Construction Company, Ltd., Watsonville, \$131,870.90; Valley Paving and Construction Company, Fresno, \$164,753.80; Clark & Henery Construction Company, San Francisco, \$151,920.80; Peninsula Paving Company, \$138,695.50; Jones and King, Hayward, \$148,379.90; Frederickson & Watson Construction Co., Frederickson Bros., Oakland, \$154,552.50; Heafey-Moore Co., Oakland, \$143,718.60; Hanrahan Company, San Francisco, \$129,934; Tieslav Bros. and A. Mitchell, Sacramento, \$141,300.60. Contract awarded to Basich Brothers, Torrance, \$112,910.

SANTA CLARA COUNTY—District IV, Route 2, furnishing and applying light fuel oil to earth shoulders each side of existing pavement between northerly boundary and Santa Clara, about 13.7 miles. Pacific Truck Service, Inc., San Jose, \$1,488; Lee J. Immel, Berkeley, \$1,618.80; Tiffany-McReynolds-Tiffany, San Jose, \$1,500. Contract awarded to Palo Alto Road Materials Co., Ltd., Palo Alto, \$1,342.80.

SANTA CRUZ COUNTY—District IV, Route 5, Santa Cruz, between Inspiration Point and Vine Hill, road, about 5.1 miles, clear and grub highway right of way. Moore & Washburn, Santa Cruz, \$34,000; Arthur Mitchell, Sacramento, \$41,650; L. C. Seidel, Oakland, \$47,430; Meyer Rosenberg, San Francisco, \$41,820. Contract awarded to J. E. Ely, Oroville, \$28,900.

SHASTA COUNTY—District II, Route 20, near Towerhouse, 17 miles west of Redding, about 0.3 mile in length to be graded and surfaced with untreated crushed gravel or stone. Milton A. Purdy, San Francisco, \$9,687.45; Chas. N. Chittenden, Napa, \$8,783.70; Skeels & Graham Co., Roseville, \$11,516.60; J. P. Brennan, Redding, \$10,268.65; G. K. Paulos & A. R. McEwen, Sacramento, \$8,918.35. Contract awarded to H. H. Boomer, San Francisco, \$6,997.05.

SOLANO COUNTY—District X, Route 53, at Rio Vista, about 0.8 to be graded and paved with P. C. concrete. Delta Dredging Co., Pittsburg, \$28,778.42; N. M. Ball, Porterville, \$24,818.97; Valley Paving and Construction Co., Fresno, \$29,798; S. M. McGaw, Stockton, \$31,347.90; Hein Bros., Basalt Rock Co. and J. V. Galbraith, Petaluma, \$28,249.95. Contract awarded to Clyde W. Wood, Stockton, \$23,926.

TUOLUMNE COUNTY—District X, Route 13, between Sonora and $\frac{3}{4}$ mile east, about 0.6 mile to be graded and surfaced with crushed gravel or stone. Force Construction Co., \$22,207.95; Bundesen and Lauritzen, \$26,221.25; A. Teichert & Son, Inc., \$21,834.20; A. Mitchell, \$28,853; L. G. Kipp, Sacramento, \$21,172.70; Poulos and McEwen, Sacramento, \$25,362.18; Clyde W. Wood, Stockton, \$20,332; Hemstreet & Bell, Marysville, \$21,371.70; Willard-Biasotti & Lovotti, Stockton, \$20,727.25.

VENTURA AND LOS ANGELES COUNTIES—District VII, Route 2-79, between Conejos Grade and Calabasas and between Ventura and Castaic Junction, about 40.3 miles shoulder oiling. Sander Pearson, Santa Monica, \$24,640.55; Southwest Paving Company, Los Angeles, \$21,664.60; H. E. Cox & Son, Pasadena, \$26,262; Oilfields Trucking Company, Taft, \$28,568.37; Western Motor Transfer, Inc., Santa Barbara, \$28,150.51; C. A. Ladeveze, Los Angeles, \$30,617.52. Contract awarded to Kemper Construction Co., Ltd., Los Angeles, \$19,712.94.

18 Major Projects on Schedule to be Advertised in June

(Continued from page 18)

The work will involve constructing a roadbed 40 feet and 50 feet wide and placing a Portland cement concrete pavement 20 feet wide. The new alignment of this portion of this route will shorten the distance considerably and will greatly facilitate travel between the section in the vicinity of Pomona and the beaches along the coast south of Long Beach.

On the Carmel-San Simeon Highway, which skirts the rugged bluffs along the coast line of San Luis Obispo and Monterey counties, 3.9 miles is to be improved from San Remo Divide, through Carmel Highlands, to the Carmel River in Monterey County. This project includes the realignment of the highway on this section and improvement to the grade.

It is proposed to construct a graded roadbed 30 feet and 36 feet wide and to surface the entire roadbed with decomposed granite. A similar project is now under way just to the south of the proposed work between Rocky Creek and San Remo Divide.

SCENIC COAST

The alignment on the present section has been determined with much care, so that the natural beauty of this interesting coastal region will be preserved. Under a separate contract, but included within the limits of this project, a three-arch span reinforced concrete bridge is to be placed across Wild Cat Creek just south of the Highlands. This structure is to be faced with native stone and its design and finish will blend with the surrounding rocky and wooded country.

In Alameda County part of the budgeted improvement to the Dublin Canyon road is to be set in motion this coming month with the advertising for bids for placing Portland cement concrete pavement 40 feet and 30 feet wide from Stanton Avenue to the top of Castro Hill. This new pavement will carry the improvement made last year between the Foothill Boulevard and Stanton Avenue through the Castro Valley. This suburban section of the Santa Cruz-Stockton lateral carries a large volume of heavy trucking as well as passenger traffic and the present improvement will greatly facilitate the movement of traffic. The section proposed for the present project is about $2\frac{1}{2}$ miles in length.

ELIMINATES GRADE

The construction of the second section of the new alignment between Burney and Fall River Mills includes grading and surfacing with bituminous treated crushed rock on the 10 miles between Canyon Creek and Hat Creek Summit in Shasta County. Work has just begun on the 8.9 miles between Hat Creek Summit and Fall River Mills. These two projects, together with bridges across the Pit River, Hat Creek and Fall River, are to be constructed on new alignment and grade on this 20-mile section of the Redding-Alturas lateral and will eliminate the existing tortuous road which winds through the lava country over many small summits. At Fall River Mills these improvements will connect with some 66 miles of recently improved highway.

In Mendocino County north of Rattlesnake Summit it is proposed to grade and surface the approaches to the bridges now under construction across Little Dann Creek and Cedar Creek.

Mono Snow Conquest an Epic of Heroic Effort Tinged With Tragedy

By F. G. SOMNER, District Engineer (Retired)

On the eve of his retirement, after twenty years of outstanding work as the pioneer district engineer in the State highway service, F. G. Somner, of District IX, was faced with one of the hardest tasks of his arduous career when blizzards buried the Mono Basin region under 130 inches of snow last January. He tells a vivid story of the pluck and fortitude of the highway relief crews and the saving of two lives, characteristically giving all the credit to others.

THIS narrative does not treat of snow removal under systematic preparation. There was neither time nor opportunity for the provision of steam-heated quarters for men and machinery, similar to the Donner Pass organization, nor for the assembling of modern snow fighting equipment.

The line of action extended for a distance of 105 miles along the base of the east slope of the High Sierra, the thermometer registering from zero to 43 degrees below, accompanied from time to time by driving blizzards.

The task covered the Conway and Deadman passes, elevation over 8000 feet, the highest summits on which snow removal has been in progress, involving the longest stretch and the most difficult task of the kind ever undertaken in California, and it may be added, within the most remote region of the State.

TRAGEDY AVERTED

In the latter part of December, 1931, when the call came for relief to the marooned residents of Mono Basin and vicinity, there were no snow plows available, and the task of opening Route 23 of the State highway from Mono Basin to Bishop, over two summits, was too formidable a task for the equipment at hand, so the opening of the McPherson Grade, which connects with the Bishop-Montgomery Pass, State highway route 76, was selected as an expedient affording at least temporary relief.

If any conjectures ever existed as to the dire necessity for the prompt assignment of State maintenance forces to this task, they have been long ago set aside, owing to the fact that the lives of two persons were thereby saved. The facts from the statements of the survivors of their escape from an awful death are as follows:

SURVIVORS' STORY

Mary J. Morrison and nephew, John M. Curtin, on December 23d, while en route to

Leevining, having planned a Christmas surprise visit to Supervisor J. A. Mattly and family, encountered a severe snow storm on the McPherson Grade, when their car was stalled in the drifts 27 miles from their destination. There was no recourse but to occupy the car for protection from the intense cold and blizzards.

The storm continued with increased fury until January 1, and the car at times was prevented from being buried in the snow only by the most laborious efforts, with attending exposure to the fury of the elements. Snow shoes were improvised from sign boards found nailed to the trees, and John Curtin valiantly each day, in desperation, attempted to reach assistance. Two egg sandwiches with a small piece of cheese can not sustain life very long, particularly under such strenuous conditions, and for these unfortunates, snow was chiefly their food and drink.

DESPERATE HEROISM

On the night of January 2, after 10 days of waiting, hoping and suffering, Curtin, starved and exhausted, but with the heritage of indomitable courage still alive within him, made his final attempt to reach assistance. The fears of aunt and nephew were at all times intensified by the knowledge that no one knew of their plight; Curtin had in his mind at every step the impending fate of his beloved relative, whose life was dependent upon his survival.

With the screams of coyotes and the lurking tread of other wild animals waiting for their prey within hearing distance, adding to her terror, Mrs. Morrison, alone in the car, exhausted in mind and body, awaited what appeared to be inevitable death.

Twenty hours after Curtin left the car, and seventeen miles away, Paul Peak, with his snow fighting crew, met a staggering

(Continued on page 30)



AFTER THE STORM scenes in relief of Mono Basin: No. 1, a "muck stick" crew breaking road between Mono Lake and Bridgeport. No. 2, Snowplow operating along Rock Creek, north of Bishop. No. 3, "The Lonesome Trail"—snowshoe party taking in mail and supplies by sled. No. 4, Mono Lake in winter setting. No. 5, battling drifts near Convict Creek in Long Valley. No. 6, Piling it high with steam shovel equipment. No. 7, John Curtin, navy man, hero survivor of tragic rescue journey. No. 8, Mrs. Mary J. Morrison, aunt of Curtin, saved from perishing by his heroism.

Relief Crews Battled 50 Miles of Snow

(Continued from page 28)

human being, speechless and demented, with his life ebbing at every step.

With frozen feet, John Curtin presented a pitiable sight, the sad remains of a marvelous specimen of physical manhood. Paul Peak measured up to his responsibility in usual fashion, and to him and his hardy crew too much credit can not be given for their prompt action in the rescue of Mrs. Morrison and the speeding of John Curtin and his aunt to a physician's care.

STILL IN HOSPITAL

Thus endeth the story—a most worthy chapter in the epics of the achievements and fortitude of men and women. John Curtin, aged 28, still lies at this writing in Ward No. 7, Naval Hospital at Mare Island, having suffered the loss of several of his toes. He is first musician, Orchestra U. S. S. Flagship Pennsylvania.

Mrs. J. Morrison, his aunt, is a registered nurse, having served in the Spanish War and Philippine insurrections. This brave woman still suffers in mind and body from the effects of the terrible ordeal.

The opening of the McPherson Grade, a connecting road with the Montgomery Pass highway, provided relief for the time being only, as continued storms soon again closed this road to travel.

Importunities of the marooned, scattered residents between the Mono Basin and Owens Valley led for the second time to the intervention of Governor Rolph, prompted by the efforts of Senator Joe Riley of Bishop, resulting in the organization on February 25, by P. L. Fite, maintenance engineer, of a snow removal crew, comprised of twenty men, with a snow plow, tractors, bulldozers and "V" plows.

OPENED FIFTY MILES

For twenty-four hours a day, in eight hour shifts, along the east slope of the High Sierra, Paul Peak, with an experienced crew inured to hardships, plowed a path from Sherwin Hill to the Mono Lake Basin, a distance of fifty miles. A maximum depth of 131 inches of snow had already fallen when the work was started, which had become packed and frozen, with no sign of a road anywhere in sight.

Although there was no opportunity for the installation of proper accommodations in advance, suitable quarters were found for the

men. The equipment did not fare as well. The strain occasioned by adverse conditions, caused continuous breakdowns, with arduous repair tasks, and attendant loss of time. Hampered by extreme cold and backing up, occasioned by driving blizzards covering up progress, the task was a gruelling one.

It is traditional of the Deadman Hills that the strongest and the bravest have been conquered. The job demanded its pound of flesh from the hardy men who braved its perils, but it was accomplished.

NORTH END BATTLE

Meantime, extreme conditions prevented further progress of the mail carriers on snow shoes, sleds and horseback from Bridgeport to Mono Lake, a distance of twenty-five miles, creating the necessity of immediate relief to the residents of Bodie and Mono Lake, who were getting short of supplies.

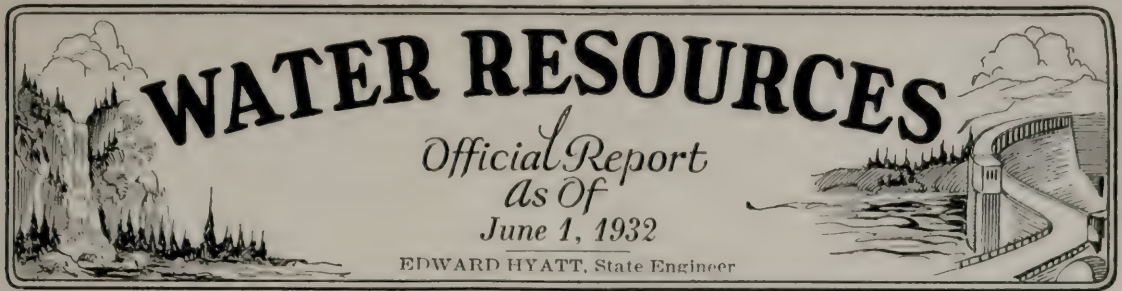
With tractors, teams, graders and shovels, the State and county forces, under the direction of Dwight Wannacot, maintenance superintendent, comprising sixty men, surmounted this difficulty. Snow removal had been in progress all through the winter months from Bridgeport to the Bodie Junction, a distance of seven miles, in order to alleviate the difficulties of mail delivery.

At times the thermometer in this locality registered forty-three degrees below zero at night and fifteen degrees at midday, undoubtedly the coldest weather prevailing in California. Snow removal under improved conditions was completed in short order from Bridgeport to Coleville, a distance of thirty-five miles, and on April 10, an open road was declared from Los Angeles to Reno.

BIG PARADE OF 1932

A report just issued for last year by the Department of Motor Vehicles reveals that visiting motorists who toured the State in their own cars during 1931 came not only from every State in the Union, but from Alaska, Belgium, Canada, China, Cuba, England, France, the Island of Guam, Haiti, Hawaii, Holland, Italy, Japan, Mexico, Nova Scotia, Panama, The Philippine Islands, Porto Rico, Prince Edward Island, San Salvador, Samoa, and Trinidad.

Due to the Olympic Games to be held in Los Angeles this summer, it is believed that a new record will be established both for motorists from foreign countries, and from the eastern states, as inquiries from prospective motor caravans are coming in large numbers to motoring organizations.



General water conditions continue to show an improvement over last year, according to the report of State Engineer Edward Hyatt, covering activities of the Division of Water Resources for May. A low flood state has been reached in the San Joaquin River due to melting snows, and increased stream flows are recorded in the Los Angeles, San Gabriel and Santa Ana basins. Details concerning dam projects, irrigation districts, snow surveys, water resources investigations, and the State Water Plan are included in the report, as follows:

Conditions with respect to an ample water supply for the season continue to be promising and hopeful with prospects exceedingly better than the season of 1931. A number of the irrigation districts began distribution of irrigation water at earlier periods than heretofore in view of the sufficiency of water supply and the problem apparent to landowners and producers will be to secure a financial return for crops which will be commensurate to costs of production.

The economic problems confronting irrigation districts were the subject of comment and discussion during the meeting of the California Irrigation Districts Association which was held in Fresno on May 12 and 13. The meeting of the association was attended by an excellent representation of individuals in behalf of many irrigation districts and one session thereof was attended by the State Engineer.

REPORTS RENDERED

Conforming to the general policy of rendering financial statements for the information and review by the State Engineer, the following irrigation districts have rendered reports:

Banta-Carbona	Montague Water Conservation
Big Springs	Naglee Burk
Camp Far West	Newport Mesa
Carpenter	Owens Valley
El Dorado	Riverdale
Fresno	Stinson
Glenn-Colusa	West Side
Grenada	West Stanislaus
Imperial	

The city of San Diego is excavating for the foundation of the El Capitan Dam on the San Diego River which will save 118,000 acre-feet for domestic consumption which would otherwise run to waste.

The city of Pasadena recently commenced work on Pine Canyon Dam in the San Gabriel River. This will be a large dam of concrete gravity type, storing 40,000 acre-feet of water.

The State Engineer has commenced issuing certificates of approval of dams built prior to August

14, 1929, in accordance with the requirements of the Dam Act, which makes it mandatory that he either issue certificates of approval of such dams by August 14, 1932, or orders directing such work as may be necessary to make them safe. Field investigations and office studies have enabled the department to reach conclusions on over 400 dams and certificates will be issued for these as rapidly as necessary procedure will permit.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Practically all of the equipment and material previously stored at various points of the project in Sutter County, has been concentrated at the new headquarters near Sutter City, and the work of putting this material in order has continued. Also, considerable of the property stored in the Sacramento warehouse has been moved to Sutter City.

The earth dam across Gilsizer Slough has been materially strengthened and raised, so that it will be less likely to wash out each year. Willows have been planted for its protection. The water has been held up in the east levee borrow pit for the benefit of the willows planted for bank protection.

Fire guards have been made around a number of the timber structures of the project by removing inflammable weeds and grass, and this work is being continued. Repairs have been made on a number of bridges, principally on the floors. In some of our bridges the floors are subject to excessive wear, on account of the passage of tractors and farm machinery.

Emergency Flood Protection and Rectification of Rivers.

All active work of this class recently under way has been completed. An examination was recently made of banks requiring protection on the Mad River, Yager Creek and Van Duzen River, in Humboldt County. It appears necessary to do work which will cost at least \$6,000, on these streams, in cooperation with local interests, and the necessary arrangements are now being made.

Sacramento Flood Control Project—Bank Protection.

No work of this class is under way at the present time, and activities are limited to the care and upkeep of equipment.

REFUNDING DISCUSSED

On May 20, in lieu of a regular meeting of the California Districts Securities Commission, an informal discussion was conducted by members of the commission with respect to the refunding of bond issues by several California irrigation districts under certain conditions of refinancing.

South Active in Building of Dams

(Continued from page 31)

DAMS

To date 805 applications have been received for approval of dams built prior to August 14, 1929; 94 for approval of plans for construction or enlargement and 264 for approval of plans for repair or alteration.

Application was received from the city of San Jose for approval of plans and specifications for construction of an earth fill dam across the East Fork of Penetencia Creek in Santa Clara County to form a lake for recreational purposes.

Applications Received for Approval of Plans for Repair or Alteration.

DAM	OWNER	COUNTY
Suisun	Town of Suisun	Solano
Pine Grove	San Juan Ridge Mutual Water Company	Nevada
Filoli	Filoli, Inc.	San Mateo
Bear River	Pacific Gas & Electric Company	Amador
Baldwin	Pacific Gas & Electric Company	Shasta
Bidwell Lake	Bidwell Water Company	Plumas
San Pablo	East Bay Municipal Utility District	Alameda
Puddingstone	L. A. County Flood Control District	Los Angeles
Lower Feather	Feather River Improvement Company	Plumas

Plans Approved for Construction.

DAM	OWNER	COUNTY
La Patera	Sherman P. Stow Company	Santa Barbara
Patrick Reservoir	Santa Catalina Island Company	Los Angeles

Plans Approved for Repair or Alteration.

Eleven such applications were approved during this period.

There is considerable activity at the present time in dam building in the southern part of the State. The Los Angeles County Flood Control District has started work on San Gabriel No. 2 Dam in the West Fork of the San Gabriel Canyon, a large rock fill structure.

The city of Los Angeles has started work on Bouquet Canyon Dam which will be an earth fill structure capable of storing 36,200 acre-feet of water.

Russian River Jetty.

Inasmuch as the weather conditions from now until December first will be favorable, it is proposed to start work in the quarry on about June first and to commence depositing rock in the jetty by June fifteenth.

Flood Measurements and Gages.

A low flood stage has been reached in the San Joaquin River on account of melting snows, and discharge measurements have been made at Mossdale bridge, Paradise Cut and Vernalis. A discharge measurement was also made on the Bear River at Wheatland at a low flood stage, in connection with the preparation of a rating curve. The routine work of maintaining the continuous water stage recorders has been continued, and the compilation of records has proceeded in the office.

WATER RIGHTS

Applications to Appropriate.

A complete list of the applications to appropriate

water received and approved during the month of April will be found elsewhere in this issue. Twenty-seven applications were received, 12 were denied, 13 were approved and 34 licenses were issued.

Inspections of projects under permit and investigations of protested cases were made during the month in San Diego, Los Angeles, Riverside, San Bernardino, Ventura, Santa Barbara, San Luis Obispo, San Benito, Monterey, Santa Cruz, Napa, Lake, Sonoma, Mendocino, Humboldt, and Trinity counties.

ADJUDICATIONS

Shasta River (Siskiyou County)—Case pending in the Superior Court of Siskiyou County.

Whitewater River (San Bernardino and Riverside Counties)—Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

North Cow Creek (Shasta County)—The North Cow Creek case (*Charles L. Lemm et al. vs. John Rutherford et al.*) referred to the Division by the Superior Court of Shasta County by Order of Reference dated April 25, 1923, was terminated by a decree entered by the court on April 29, 1932. The decree adjudicates water rights to the extent of 30.63 cubic feet per second for the irrigation of 1332 acres and a small amount of municipal use at Ingot, and 7.50 cubic feet per second for power purposes. The water rights defined are appurtenant to 49 property tracts which are served by 46 diversion conduits.

Oak Run Creek (Shasta County)—The Division's report as referee in the Oak Run Creek case is in the course of preparation.

Clover Creek (Shasta County)—Action on the case in the Superior Court of Shasta County is pending the outcome of negotiations for settlement by stipulation.

Deep Creek (Modoc County)—The schedule of allotments adopted by the water users for trial distribution during the 1932 irrigation season was administered by a water master throughout the month.

Franklin Creek (Modoc County)—The schedule of allotments for trial distribution for the 1932 irrigation, adopted by the water users on March fourteenth, was administered by a water master throughout the month.

New Pine Creek (Modoc County)—The stipulation for judgment submitted to the water users at a conference held at New Pine Creek on March 16, 1932, has been signed by all parties at interest, except one.

Eagle Creek (Modoc County)—The waters of Eagle Creek were distributed throughout the month in accordance with the plan for trial distribution adopted by the water users on March fifteenth.

South Fork Pit River (Modoc County)—Field work on the South Fork Pit River Reference was carried on throughout the month, including distribution of the waters of the stream system in accordance with the schedule of allotments adopted for the 1932 season.

Stream Flow Estimate Increased

(Continued from preceding page)

Pine Creek (Modoc County)—The water users have agreed to a plan of distribution to be tried out during the 1932 season; and the waters of the stream were distributed in accordance with such plan during the month.

Cottonwood Creek (Modoc County)—The case of *Oliver vs. Robnett, et al.*, involving the rights to the use of the waters of Cottonwood Creek in Goose Lake Valley, was referred to the Division by the Superior Court of Modoc County by an Order of Reference dated May 19, 1932. The determination covers an irrigated area of approximately 1000 acres.

WATER DISTRIBUTION

Hat Creek (Shasta County)—Water master service for the 1932 season was commenced on Hat Creek on May first.

Pit River in Big Valley (Modoc and Lassen counties)—Supervision of diversions from Pit River in Big Valley for the 1932 season was commenced on May first.

Cedar, Davis, Deep, Eagle, Emerson, Franklin, Mill, New Pine, Owl, Pine and Soldier creeks and South Fork Pit River (Modoc County)—Water master service on these streams was continued throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Field work comprising the measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, has increased during the past month in proportion to the increase in the diversions of water with the advance of the season. In the office, work has continued in completing the report for the 1931 season and the special report on losses in 1931 due to salinity and water shortage. Sampling at the permanent salinity stations in the upper bay and delta region and operation of the tide gages has been maintained. Recent salinity tests show the following:

Salinity Tests, Upper Bay and Sacramento-San Joaquin Delta, May 10, 1932

Station	Salinity in parts of chlorine per 100,000 parts of water
Point Orient.....	920
Point Davis.....	380
Bullshead.....	80
Bay Point.....	2
O and A Ferry.....	2
Collinsville.....	1
Antioch.....	1
Jersey.....	2
Central Landing.....	2
Middle River P. O.....	4

At present the major streams supplying the Sacramento-San Joaquin valleys are showing the effects of the melting snow and the flow of the Sacramento River at Sacramento on April sixteenth was 43,000 cubic feet per second.

CALIFORNIA COOPERATIVE SNOW SURVEYS

Although the principal snow surveys as a basis for stream flow estimates were made at the last of March and reported in the April first bulletin, additional surveys were made in the latter part of April at the key snow courses to furnish information for possible modification of earlier estimates in accordance with the addition to or melting of the snow pack since April first. These later surveys complete the seasonal record of monthly surveys, February to May, for the key snow courses.

The recent surveys showed that melting has occurred at all measured snow courses below 8000 feet but above that elevation, six out of sixteen courses on the western Sierra slope showed an increase in the pack and water content over the April first measurements. In general, for a given elevation below 8000, the results indicated an increase in the percentage of melting in going from northern to southern basins of the Sacramento-San Joaquin drainage. For the 8000-foot elevation the average per cent of melting appeared to increase, north to south, from about 5 to 20 per cent; for 7000-foot elevation from about 15 to 30 per cent; for 6000, from about 35 to 75 per cent; and for 5000, from about 65 to 100 per cent. In 1931 the corresponding data indicated melting at all measured courses; varying from 5 to 70 per cent for those above elevation 7500 and practically 100 per cent or no snow for all courses below 7500.

INCREASED STREAM FLOW

As was the case on April first, the average precipitation to May first in per cent of normal showed, in general, a progressive increase in going from northern to southern stream basins of the western Sierra slope, with a variation from about 80 per cent in the north to 130 per cent in the south. The Los Angeles, San Gabriel and Santa Ana basins showed a variation from about 115 to 140 per cent and the basins of the eastern Sierra slope varied from about 100 per cent in the Truckee and Tahoe basins to about 140 per cent in the Owens basin.

The above normal April precipitation in northern basins combined with the small percentage of melting or actual increase of the snow pack at the higher elevations seemed to warrant a slight upward modification of the estimates given on April first for seasonal stream flow in these basins. On this basis the estimate of the seasonal stream flow in per cent of the 40-year average (1889-1929) for the entire Sacramento basin including tributaries was increased from 75 to 80 per cent. In San Joaquin basins, the barely normal or subnormal April precipitation combined with the greater percentage of melting and lesser actual accretions to the high elevation snow pack appeared to warrant no change in the April first stream flow estimates and the estimate of the 1932 seasonal stream flow for the entire Sacramento-San Joaquin drainage remains at 90 per cent, the April first figure.

(Continued on page 38)

All Clear for the Olympiad With Big Highway Program Completed

BETWEEN July 30th and August 14th the Tenth Olympiad will be held in Los Angeles. During the summer California will be host to the thousands who are making their way to the southwestern metropolis to witness the foremost sport classic of the world. That the visitors within the boundaries of the State may be granted every facility for travel, the Department of Public Works has rushed work on the main State highways leading into Los Angeles.

The following paragraphs present brief descriptions of some of the more important work on these arterials which has been rushed to completion in the past few months and projects now being finished in order that they may be ready by the time set for the opening of the Olympic games.

NEW TUNNEL OPENED

On the Victory Highway, important improvement has been completed in Placer County with the placing of Portland cement concrete pavement between Newcastle and Auburn and in the opening of the new tunnel under the town of Newcastle. Work on this section of transcontinental highway has been under way for the past eighteen months and the new pavement presents a section of modern highway through the Auburn ravine, and the tunnel under the Newcastle hill obviates the heavy grade and crooked alignment through the business portion of that town.

Four major projects have recently been completed on the Golden State Highway which connects the capitol city of Sacramento with Los Angeles via the broad and fertile San Joaquin Valley.

Between Turner Station and Stockton in San Joaquin County, five miles of Portland cement concrete pavement 20 feet wide have been placed and the remaining two miles surfaced with a bituminous non-skid surface. This project called for widening the old narrow roadbed and required the construction of nine bridges and the widening of two. This improvement brings to modern standards of high-speed highway construction the seven miles immediately south of Stockton.

Further south, the narrow twenty-year-old

bridge across the Fresno River at Madera has been replaced with a modern steel stringer bridge composed of twelve 41-foot spans on steel pile bents. The new structure and the new paved approaches were placed on an improved alignment at this river crossing and provide an improvement which can adequately care for the heavy traffic borne by the central artery of the State's highway system.

In Tulare County the roadbed of the highway between Goshen and Kingsburg has been widened to a full 36 feet and the entire 12 miles paved with asphalt concrete 20 feet wide and a 30-foot pavement placed through the town of Kingsburg.

In conjunction with the road work on this section of the Los Angeles-Sacramento arterial four reinforced concrete girder bridges were constructed and two existing bridges widened. All of the structures on this portion of the route now provide a clear roadway width of 34 feet.

CROSSINGS ELIMINATED

The seven and a half miles of highway just south of Tulare have been constructed on an alignment entirely on the easterly side of the tracks of the Southern Pacific Railroad, thereby eliminating from the State road system the grade crossings at Tipton and Tulare. This new construction meets the requirements of modern thoroughfares with its 20-foot Portland cement concrete pavement and eight-foot shoulders. Five bridges were required on this section, all providing a clear roadway 34 feet wide.

On the main interstate highway connecting Los Angeles and Salt Lake City work has been pushed forward so that as great a mileage as possible on this important entrance into southern California be graded and surfaced to modern standards.

Two contracts covering construction on nearly 37½ miles have been completed this spring. One included the highway from the Cronise Valley to six miles west of Baker and the other contract extended from six miles west of Baker to Halloran Summit. Of the 193 miles of this route between San Bernardino and the State line near Jean,

Giant of Forest Laid Low; Victim of an Insect Pest

THE CALIFORNIA Department of Public Works is always reluctant to sanction the cutting down of trees. The policy is to preserve them whenever practically possible and encourage the planting of them along State highways. Occasionally circumstances make the removal of a tree necessary as happened in the case of a giant yellow pine, long a landmark on the Big Bear road, in San Bernardino County. The facts are given as follows by Assistant Highway Engineer B. A. Switzer of District VIII:

"During the fall of 1931 it was noticed a huge yellow pine tree, alongside the State highway on the recreational road to Bear Valley, was dying through an attack of the Western Pine Beetle. The tree died during the winter and in order to prevent infection to adjacent areas and to remove a possible hazard from the State highway, it was decided to cut the tree down.

"The tree was removed with unemployment relief workers in May. It was found to be 157 feet in height and over six feet in diameter.

"The tree was cut 12 feet above the ground surface in order that a sort of memorial might be left and admired by the traveling public. Four hundred and seventy-five annual rings were counted at this cut, which gives an age of over 500 years for this ancient monarch of the forest. This tree was located at Deer Lake approximately 28 miles from San Bernardino on the San Bernardino-Bear Valley highway."

There are more than 7850 motorcycle traffic officers in the United States, according to a report on a nation-wide survey. Nearly three-fourths of these officers are in the service of municipal police departments. Approximately 2000 are members of state highway patrols and state police.

FISCAL ADVISORY BOARD NAMED FOR SAN FRANCISCO-OAKLAND BAY BRIDGE

(Continued from page 3)

height will be used in the west bay channel structure in addition to the center anchorage.

Each of the four towers in the west bay structure will be topped by airplane beacons with navigation lights marking clearance and fenders.



"WHAT A FALL was there, my countrymen," when this 157-foot giant yellow pine, killed by disease, smote the earth.



FIVE HUNDRED YEARS it withstood all vicissitudes of the elements on a San Bernardino Mountain slope only to fall victim to an insect pest. It measured six feet in diameter at the butt.

The piers under the two 460-foot towers will cost \$1,750,000 and \$2,750,000, one being sunk 100 feet to bedrock and the other to 175 feet. The center anchorage, to which the cables from each side structure will be secured, will cost approximately \$4,500,000. The center anchorage as designed will be 110 feet by 220 feet, and will rise 300 feet above water and will extend 210 feet below water to a solid foundation in thoroughly tested bedrock. It will be of concrete and steel.

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of May, 1932.

INYO COUNTY—Tungsten, Upper Dam No. 704. J. V. Baldwin Motor Co., Los Angeles, owner; rockfill, 33 feet above streambed with a storage capacity of 8 acre-feet, situated on Deep Canyon tributary to Horton Creek in T. 7 S., R. 31 E., M. D. B. and M. For storage of tailings.

INYO COUNTY—Tungsten, Upper Dam No. 704-2. J. V. Baldwin Motor Co., Los Angeles, owner; sand, 27 feet above streambed with a storage capacity of 2 acre-feet, situated on Deep Canyon tributary to Horton Creek in T. 7 S., R. 31 E., M. D. B. and M. For storage of tailings.

LASSEN COUNTY—Ward Lake Lower Dam No. 227-2. Gibson Land Company, Litchfield, owner; earth, 18 feet above streambed with a storage capacity of 900 acre-feet, located in Sec. 5, T. 29 N., R. 14 E., M. D. B. and M. For storage purposes for irrigation use.

LASSEN COUNTY—Meadow Brook Farm Dam No. 229. L. R. Cady and Frank Coffin, Susanville, owners; masonry, 20 feet above streambed with a storage capacity of 10 acre-feet, situated on Baxter Creek tributary to Honey Lake in Sec. 26, T. 29 N., R. 12 E., M. D. B. and M. For storage purposes for irrigation and recreation use.

SIERRA COUNTY—Kanaka Dam No. 299. Kanaka Mines Syndicate, San Francisco, owner; log crib, 30 feet above streambed with no storage capacity, situated on Kanaka Creek tributary to Middle Fork Yuba River in Sec. 5, T. 18 N., R. 10 E., M. D. B. and M. For diversion purposes for mining and milling use.

LASSEN COUNTY—Ward Lake Upper Dam No. 227. Gibson Land Company, Litchfield, owner; gate, located in Sec. 32, T. 30 N., R. 14 E., M. D. B. and M. For storage purposes for irrigation use.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of May, 1932.

SHASTA COUNTY—Baldwin Dam No. 97-85. (Removal.) Pacific Gas and Electric Company, San Francisco, owner; earth, 19 feet above streambed with a storage capacity of 100 acre-feet, located in Sec. 33, T. 31 N., R. 1 E., M. D. B. and M. For storage purposes for power use.

PLUMAS COUNTY—Bidwell Lake Dam No. 273. Bidwell Water Company, Greenville, owner; earth and rock, situated on North Canyon Creek tributary to Indian Creek in Sec. 15, T. 20 N., R. 9 E., M. D. B. and M.

ALAMEDA COUNTY—San Pablo Dam No. 31-6. East Bay Municipal Utility District, Oakland, owner; earth, situated on San Pablo Creek tributary to San Francisco Bay in Lot 5 Rancho El Sobrante.

LOS ANGELES COUNTY—Puddingstone Dam No. 329. Los Angeles County Flood Control District, Los Angeles, owner; earth, situated on Puddingstone Creek tributary to Walnut Creek in Sec. 15, T. 1 S., R. 9 W., S. B. B. and M.

PLUMAS COUNTY—Lower Feather River Dam No. 282-2. Feather River Improvement Co., Blairsden, owner; earth, situated on Middle Fork tributary to Feather River.

TRINITY COUNTY—Lower Stewarts Fork Dam No. 212. La Grange Placers, Ltd., Weaverville, owner; rock masonry, situated on Stuarts Fork tributary to Trinity River in Sec. 3, T. 36 N., R. 10 W., M. D. B. and M.

PLANS APPROVED

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of May, 1932.

NEVADA COUNTY—Pine Grove Dam No. 312-2. San Juan Ridge Mutual Water Association, Marysville, owner; earth, situated on unnamed creek tribu-

tary to South Yuba River in Sec. 19, T. 17 N., R. 8 E., M. D. B. and M.

SAN MATEO COUNTY—Filoli Dam No. 617. Filoli, Inc., San Mateo, owner; earth, situated on branch of Laguna Creek tributary to San Mateo Creek in Sec. 30, T. 5 S., R. 4 W., M. D. B. and M.

AMADOR COUNTY—Bear River Dam No. 97-61. Pacific Gas and Electric Company, San Francisco, owner; rock, situated on Bear River tributary to North Fork Mokelumne in Sec. 9, T. 8 N., R. 16 E., M. D. B. and M.

MARIN COUNTY—Belvedere Dam No. 33-4. Marin Municipal Water District, San Rafael, owner; earth, located on south slope of Tamalpais.

SHASTA COUNTY—Baldwin Dam No. 97-85. Pacific Gas and Electric Company, San Francisco, owner; earth, 19 feet above streambed with a storage capacity of 100 acre-feet, located in Sec. 33, T. 31 N., R. 1 E., M. D. B. and M. For storage purposes for power use.

PLUMAS COUNTY—Bidwell Lake Dam No. 273. Bidwell Water Company, Greenville, owner; earth and rock, situated on North Canyon Creek tributary to Indian Creek in Sec. 15, T. 26 N., R. 9 E., M. D. B. and M.

ALAMEDA COUNTY—San Pablo Dam No. 31-6. East Bay Municipal Utility District, Oakland, owner; earth, situated on San Pablo Creek tributary to San Francisco Bay, located on Lot 5 Rancho El Sobrante.

LOS ANGELES COUNTY—Puddingstone Dam No. 32-9. Los Angeles County Flood Control District, Los Angeles, owner; earth, situated on Puddingstone Creek tributary to Walnut Creek.

MODOC COUNTY—McBrien River Dam No. 152-6. McBrien Estate and Mrs. E. G. McConnell, Alturas, owners; buttress, situated on Pit River tributary to Sacramento in Sec. 16, T. 42 N., R. 11 E., M. D. B. and M.

PLUMAS COUNTY—Feather River, Lower Dam No. 282-2. Feather River Improvement Co., Blairsden, owner; earth, situated on Middle Fork Feather tributary to Feather River.

Governor Rolph's Water Commission Reports

(Continued from page 25)

Relative to its Recommendation No. 2, the committee states:

"From personal observation and knowledge we concede the acute situation existing in the counties of Tulare and Kern, where a constantly increasing number of farms and homes are being abandoned from the effects of the continued lowering of their water levels, and the necessity for salinity control in the Sacramento-San Joaquin delta area. Therefore, we deem it essential that every possible means be put into force to expedite as soon as possible the necessary structures and works to alleviate these situations."

Appended to the main report are a statement by Senator Ralph E. Swing, and a minority report by Senator W. P. Rich, Senator Ralph H. Clock and Assemblyman J. E. Frazier, setting forth their views and objections to certain features of the report.

"Well," said the customs inspector at the Canadian border to the dusky driver of the ancient Ford. "Have you any dutiable stuff?"

"No, sah," said the dusky driver. "I got me a couple bottles o' gin, but that ain't no duty; at's a pleasure."—*The Earth Mover*

May Water Applications and Permits

Applications for permit to appropriate water filed with the State Department of Public Works, Division of Water Resources, during the month of May, 1932.

NEVADA COUNTY—Application No. 7250. William F. Nickel, Box 294, Nevada City, for 25 c.f.s. from South Fork of Little Deer Creek tributary to Deer Creek and Yuba River to be diverted in Sec. 2, T. 16 N., R. 10 E., M. D. B. and M., for mining and domestic purposes.

PLACER COUNTY—Application 7251. W. C. Ham-matt, 1004 Hearst Bldg., San Francisco, for 120 c.f.s. and 50,000 acre-feet per annum from Middle Fork American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M., for power purposes (5460 h.p.).

MODOC COUNTY—Application 7252. F. A. Neasham and Lloyd Neasham, c/o A. F. Neasham, Bidwell, for 6 c.f.s. and 400 acre-feet per annum from Lieberman Creek tributary to Upper Alkali Lake to be diverted in Sec. 9, T. 45 N., R. 17 E., M. D. B. and M., for irrigation purposes (480 acres).

SISKIYOU COUNTY—Application 7253. Chas. E. Hudson and R. E. Colburn, c/o Chas. E. Hudson, 321 Bush street, San Francisco, for 12 c.f.s. from South Fork of Clear Creek tributary to Klamath River to be diverted in Sec. 21, T. 15 N., R. 6 E., H. B. and M., for mining purposes.

TUOLUMNE COUNTY—Application 7254. State of California, Dept. of Public Works, Division of Highways, District X, for 0.005 c.f.s. from Blue Spring tributary to Sullivan Creek, thence Woods Creek and Tuolumne River to be diverted in Sec. 19, T. 2 N., R. 16 E., M. D. B. and M., for recreational purposes. Estimated cost \$300.

EL DORADO COUNTY—Application 7255. B. W. Stone, 16 California St., San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River (2) Pilot Creek (3) Gerle Creek (4) Loon Lake (5) Buck Island Lake (6) Rock Bound Lake (7) Little South Fork Rubicon River, tributary to American River Drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E., M. D. B. and M., Sec. 11, T. 12 N., R. 12 E., M. D. B. and M., Sec. 24, T. 13 N., R. 13 E., M. D. B. and M., Secs. 11, 31 and 34, T. 14 N., R. 14 E., M. D. B. and M., Sec. 4, T. 13 N., R. 15 E., M. D. B. and M. and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M., for municipal purposes.

LOS ANGELES COUNTY—Application 7256. United States, Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, for 0.003 c.f.s. from Fisher Spring tributary to Piru Creek Watershed to be diverted in Sec. 19, T. 6 N., R. 17 W., S. B. B. and M., for recreational and fire protection purposes. Estimated cost \$100.

KERN COUNTY—Application 7257. F. A. Jung-quist, 4100 Cromwell Ave., Los Angeles, for 3.0 c.f.s. from Antelope Creek tributary to Tehachapi Creek to be diverted in Sec. 28, T. 32 S., R. 33 E., M. D. B. and M., for irrigation purposes. Estimated cost \$150.

RIVERSIDE COUNTY—Application 7258. Stuart D. Allen and Sarah D. Allen, Box 28, Star Route, Redlands, for 0.5 c.f.s. from Whitewater River tributary to Salton Sink to be diverted in Sec. 24, T. 3 S., R. 3 E., S. B. B. and M., for irrigation purposes (40 acres). Estimated cost \$2000.

ALPINE COUNTY—Application 7259. State of California, Department of Public Works, Division of Highways, District X, for 0.005 c.f.s. from unnamed spring tributary to Kirkwood Creek, thence Cables Creek, Silver Fork of South Fork American River, South Fork American River and American River, to be diverted in Sec. 22, T. 10 N., R. 17 E., M. D. B. and M., for recreational purposes. Estimated cost \$250.

PLACER COUNTY—Application 7260. A. A. Gorman, Michigan Bluff, for 3.0 c.f.s. from Peavine Creek tributary to North Fork of Middle Fork American River, Middle Fork American River, American River and Sacramento River to be diverted in Sec. 14, T. 14 N., R. 12 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$3,000.

HUMBOLDT COUNTY—Application 7261. Carl O. Rothermund, Dyerville, for 3 c.f.s. from (1) and 3 c.f.s. from (2) 6 c.f.s. total, from (1) Ball Creek and

(2) Cuneo Creek, tributary to Eel River to be diverted in Sec. 36, T. 1 S., R. 1 E., H. B. and M., for industrial purposes (fish hatchery and fish ponds). Estimated cost \$400.

SISKIYOU COUNTY—Application 7262. George H. Cory, c/o Albert F. Stone, Box 61, Callahan, for 3 c.f.s. from Little Carmen Creek tributary to Grouse Creek and East Fork Scott Creek to be diverted in Sec. 29, T. 40 N., R. 7 W., M. D. B. and M., for power and domestic purposes (25.56 h.p.).

SISKIYOU COUNTY—Application 7263. George H. Cory, c/o Albert F. Stone, Box 61, Callahan, for 3 c.f.s. from Little Carmen Creek tributary to Grouse Creek and East Fork Scott River to be diverted in Sec. 29, T. 40 N., R. 7 W., M. D. B. and M., for mining and domestic purposes.

TUOLUMNE COUNTY—Application 7264. Alice Meyer, W. H. Wilson and E. J. Bartlett, c/o Alice Meyer, Groveland, for 2 c.f.s. from South Fork Tuolumne River to be diverted in Sec. 29, T. 1 S., R. 18 E., M. D. B. and M., for power purposes (8 h.p.). Estimated cost \$1,000. (Tributary to Tuolumne River.)

MONO COUNTY—Application 7265. Helen Patterson, Bishop, for 200 gallons per day from Rock Creek tributary to Owens River to be diverted in Sec. 33, T. 4 S., R. 30 E., M. D. B. and M., for domestic purposes. Estimated cost \$25.

SAN BERNARDINO COUNTY—Application 7266. W. C. Hay, 555 S. Flower St., Los Angeles, for 3.0 c.f.s. from Arctic Canyon Springs tributary to Arctic Canyon thence Mojave to be diverted in Sec. 20, T. 3 N., R. 1 E., S. B. B. and M., for power and domestic purposes (102 h.p.). Estimated cost \$25,000.

SAN BERNARDINO COUNTY—Application 7267. W. C. Hay, 555 S. Flower St., Los Angeles, for 3 c.f.s. from Arctic Canyon Springs tributary to Arctic Canyon thence Mojave Desert to be diverted in Sec. 20, T. 3 N., R. 1 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$25,000.

LOS ANGELES COUNTY—Application 7268. United States, Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, for 0.005 c.f.s. from Artesian Spring tributary to Boquet Canyon thence Santa Clara River to be diverted in Sec. 33, T. 6 N., R. 14 W., S. B. B. and M., for recreational and domestic purposes. Estimated cost \$50.

LOS ANGELES COUNTY—Application 7269. United States, Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, for 0.002 c.f.s. from White Spring tributary to Piru Creek to be diverted in Sec. 29, T. 6 N., R. 17 W., S. B. B. and M., for fire suppression purposes. Estimated cost \$40.

MONTEREY COUNTY—Application 7270. State of California, Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, for 0.0008 c.f.s. from Little Soda Springs Creek tributary to Pacific Ocean to be diverted in Sec. 25, T. 24 S., R. 5 E., M. D. B. and M., for recreational purposes. Estimated cost \$235.

MONTEREY COUNTY—Application 7271. State of California, Department of Public Works, Division of Highways, Public Works Bldg., for 0.0008 c.f.s. from Redwood Creek tributary to Pacific Ocean to be diverted in Sec. 23, T. 24 S., R. 5 E., M. D. B. and M., for recreational purposes. Estimated cost \$250.

MONTEREY COUNTY—Application 7272. State of California, Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, for 0.0008 c.f.s. from Spruce Creek tributary to Pacific Ocean to be diverted in Sec. 4, T. 24 S., R. 5 E., M. D. B. and M., for recreational purposes. Estimated cost \$250.

SIERRA COUNTY—Application 7273. C. E. Brewer, P. O. Box 1411, Station "C" Los Angeles, for 3 c.f.s. from unnamed stream tributary to South Fork of North Fork of Yuba River to be diverted in Sec. 32, T. 20 N., R. 11 E., M. D. B. and M., for mining purposes. Estimated cost \$600.

TEHAMA COUNTY—Application 7274. H. H. Hammer, Red Bluff, for 3 c.f.s. from South Fork Cottonwood Creek tributary to Sacramento River to be diverted in Sec. 12, T. 26 N., R. 8 W., M. D. B. and M., for irrigation and domestic purposes (5 acres).

Water Permits and Applications in May

(Continued from page 37)

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of May, 1932.

MENDOCINO COUNTY—Permit 3887, Application 7176. Harold H. Wonacott, Fort Bragg, May 6, 1932, for 2.00 c.f.s. from Digger Creek tributary to Pacific Ocean in (1) Sec. 24, T. 18 N., R. 18 W., M. D. B. and M., and (2) Sec. 19, T. 18 N., R. 17 W., M. D. B. and M., for industrial purposes on trout farm. Estimated cost \$1,000.

ALPINE COUNTY—Permit 3888, Application 6971. Division of Highways, District X, Sacramento, May 7, 1932, for 0.016 c.f.s. from unnamed spring tributary to Stanislaus River in Sec. 35, T. 6 N., R. 20 E., M. D. B. and M., for domestic and fire protection purposes. Estimated cost \$1,000.

TEHAMA COUNTY—Permit 3889, Application 7156. Department of the Interior, Lassen Volcanic National Park Mineral, Tehama County, May 7, 1932, for 0.50 c.f.s. from unnamed spring tributary to Battle Creek and Sacramento River in Sec. 25, T. 29 N., R. 3 E., M. D. B. and M., for domestic and fire protection purposes.

SAN JOAQUIN COUNTY—Permit 3890, Application 5807. Woodbridge Irrigation District, Woodbridge, May 9, 1932, for 300 c.f.s. from Mokelumne River, tributary to San Joaquin River in Sec. 34, T. 4 N., R. 6 E., M. D. B. and M., for domestic and irrigation of a total of 23,985.81 acres. Estimated cost \$51,600.

TRINITY COUNTY—Permit 3891, Application 6918. Trinity Loop Mining Co., 1448 Webster St., Oakland, May 14, 1932, for 10 c.f.s. from Hawkins Creek tributary to Trinity River in Sec. 21, T. 6 N., R. 6 E., H. B. and M., for mining and domestic purposes. Estimated cost \$6,000.

MONTEREY COUNTY—Permit 3892, Application 6285. Edward S. Moore and Santa Lucia Corp., Ltd., c/o Agnew & Boekel, Attys., Federal Reserve Bank Bldg., San Francisco, May 16, 1932, for 12.2 c.f.s. from West Fork Lime Kiln Creek. Vicente Creek, Big Creek, South Branch Rat Creek and tributaries, tributary to Pacific Ocean in Monterey County, in vicinity of Lucia, Cal., for domestic, recreational and subdivision purposes. Estimated cost \$500,000.

MONTEREY COUNTY—Permit 3893, Application 6570. Edward S. Moore and Santa Lucia Corp., Ltd., c/o Agnew & Boekel, Attys., Federal Reserve Bank Bldg., San Francisco, May 16, 1932, for 7.0 c.f.s. from West Fork Lime Kiln Creek and North and South Forks of Big Creek, in Sec. 9, T. 22 S., R. 4 E., M. D. B. and M., and Secs. 19 and 29, T. 21 S., R. 4 E., M. D. B. and M., for domestic purposes and the irrigation of 598 acres. Estimated cost \$500,000.

LOS ANGELES COUNTY—Permit 3894, Application 6821. Gus Wissendorf, Swartout, May 18, 1932, for 1.25 c.f.s. from Mine Gulch tributary to Prairie Fork, thence San Gabriel in Sec. 17, T. 3 N., R. 8 W., S. B. B. and M., for mining and domestic purposes. Estimated cost \$2,000.

AMADOR COUNTY—Permit 3895, Application 6505. Preston School of Industry, State of California, Waterman, May 19, 1932, for 10 c.f.s. and 2500 acre-feet per annum from Sutter Creek tributary to Mokelumne River via Dry Creek in Sec. 1, T. 6 N., R. 10 E., M. D. B. and M., for power purposes (309.8 h.p.). Estimated cost \$75,000.

AMADOR COUNTY—Permit 3896, Application 6506. Preston School of Industry, Waterman, May 19, 1932, for 8.3 c.f.s. and 2500 acre-feet per annum from Sutter Creek, tributary to Mokelumne River via Dry Creek in Sec. 1, T. 6 N., R. 10 E., M. D. B. and M., for domestic use, and the irrigation of 958.82 acres in Secs. 13, 14, 23, 24, 25, and 26, T. 6 N., R. 9 E., M. D. B. and M. Estimated cost \$75,000.

SAN DIEGO COUNTY—Permit 3897, Application 3304. Coronado Water Co., San Diego, May 21, 1932, for 7.74 c.f.s. and 614 acre-feet per annum from the flood and surplus underground waters of Tia Juana Valley Basin, tributary to Pacific Ocean in Sec. 4, T. 19 S., R. 2 W., S. B. B. and M., for irrigation of 4194.35 acres. Estimated cost \$508,375.

INYO COUNTY—Permit 3898, Application 5289. Baxter Brothers Co., Independence, May 23, 1932, for 0.25 c.f.s. from Lower Lead Canyon Spring, tributary of Saline Valley via Lead Canyon in Sec. 7, T. 12 S.,

Report of Water Resources June 1, 1932

(Continued from page 33)

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties).

Work on the report covering the three-year investigation on the Pit River has progressed during the month.

Napa Valley Investigation.

Regular weekly readings were made during April of gages and additional measurements were taken of the flow on Dry Creek and Rector Creek. In the office assembly of the data began preparatory to issuance of a report.

Santa Clara Investigation.

Such wells as could not be read for various reasons at the time of the regular March readings were read during April. Further percolation tests were made on Campbell and Los Gatos Creek and Kirk Ditch to supplement those made earlier in the season when bank seepage was a disturbing factor, and gages have been read regularly on San Antonio Creek, San Tomas Creek, Penitencia Creek and Berryessa Creek. These streams have continued to flow into the valley throughout the month and such water as has not been withdrawn by pumping will sooner or later reach the general ground water supply. Preparation of rating curves and computation of total discharges for the various stations maintained during the season is in progress.

Miscellaneous Investigations.

Good progress is being made, and work is proceeding along routine lines in the South Coastal, Ventura County, Salinas Valley and Mojave River investigations.

A bore had been talking for over an hour about himself and his achievements.

"I'm a self-made man, that's what I am—a self-made man!" he gloated.

"You quit work too soon," came a weary voice from the corner.—*No. Dakota Bulletin*

R. 37 E., M. D. B. and M., for mining and milling purposes. Estimated cost \$150.

SIERRA COUNTY—Permit 3899, Application 7189. J. K. Latta, Downieville, May 24, 1932, for 0.50 c.f.s. from unnamed ravine tributary to North Fork Yuba River in Sec. 6, T. 19 N., R. 10 E., M. D. B. and M., for mining and domestic purposes. Estimated cost \$200.

PLACER COUNTY—Permit 3900, Application 6983. Brockway Land and Water Co., 125 S. Grand St., Pasadena, May 26, 1932, for 1 c.f.s. from Griff Creek, tributary to Lake Tahoe, in Sec. 18, T. 16 N., R. 18 E., M. D. B. and M., for domestic use and the irrigation of 80-acre golf course.

MENDOCINO COUNTY—Permit 3901, Application 7095. Harold H. Wonacott, Fort Bragg, May 26, 1932, for 4000 gallons per day from South Fork Digger Creek, tributary to Big Digger Creek, thence Pacific Ocean in Sec. 19, T. 18 N., R. 17 W., M. D. B. and M., for domestic purposes.

SISKIYOU COUNTY—Permit 3902, Application 7123. William M. Clark, Happy Camp, May 28, 1932, for 1 c.f.s. from Tanner Gulch, tributary to South Fork Indian Creek thence Indian Creek and Klamath River in Sec. 11, T. 17 N., R. 6 E., H. B. and M., for mining purposes. Estimated cost \$100.

Coast Route Projects Rushed to Finish

(Continued from page 34)

Nevada, nearly 156 miles have been brought to modern standards of 36-foot roadbed and 20-foot bituminous treated crushed rock surface leaving only 37 miles yet to be improved.

ALONG COAST ROUTE

Approaching Los Angeles from the south, contracts for construction on the Coast Route connecting San Diego and Los Angeles have been forwarded which greatly improve this main highway. In San Diego County a reinforced concrete girder bridge and approaches consisting of eleven 54-foot spans on concrete piers and abutments and having a 40-foot roadway and two 4-foot sidewalks has been completed across the San Dieguito River one mile north of Del Mar. The bridge and approaches are on a revised alignment which is a marked improvement over the old line at this crossing.

Another paving contract in San Diego and Orange counties has recently been completed between San Mateo Creek and Serra. This work was an important improvement to the San Diego-Los Angeles arterial north and south of the town of San Clemente. The project involved placing 5.5 miles of pavement consisting of widening the old pavement to 30 and 40 feet with asphalt concrete and Portland cement concrete and placing new Portland cement concrete pavement 30 feet wide.

An important feature of this improvement was the construction of a 20-foot shoulder between the pavement and the Serra Bluffs, north of San Clemente, and the construction of adequate drainage facilities to care for the large volumes of water which pour over these cliffs during storm periods.

PAVEMENT WIDENED

Between Fullerton and the Los Angeles County line 4.7 miles of this southern coast route have been widened from a 23-foot pavement to 30 feet, with asphalt concrete and Portland cement concrete pavement and a new 30-foot asphalt concrete pavement has been placed on portions. This project includes improvements to line and grade, notably the flattening of the old sharp curve at Pickering corner.

On the Coast Route which connects San Francisco with Los Angeles several contracts

have been rushed to completion and it is fully expected that the pavement on this entire route will be open to traffic prior to the Olympic games.

Probably the most important improvement to be made in many years to this heavily traveled artery is the rerouting of the road between two miles north of Salinas and the Santa Clara County line in Monterey and San Benito counties, eliminating the tortuous climb over the notorious San Juan grade. The new highway lies to the west of the old road and passes through San Miguel and Langley canyons.

CURVES REDUCED

The number of curves in the 16½ miles of the new road are only 15 as against 62 over the San Juan grade. Portland cement concrete pavement 20 feet wide has been placed on a 36-foot roadbed throughout the entire project and a 300-foot steel deck truss bridge is being completed across the San Benito River and an 80-foot reinforced concrete girder bridge across San Juan Creek.

Where the Coast Route crosses the Salinas River at Bradley the new 840-foot steel deck truss bridge with its 810 feet of reinforced concrete girder approach spans and the new roadway approaches to the structure have been completed, replacing an old, narrow bridge built in 1888, and eliminating two dangerous curves at the approaches.

In San Luis Obispo County six miles of the Coast Route have been reconstructed between Los Berros Creek and Arroyo Grande and paved with Portland cement concrete 20 feet wide. Two reinforced concrete girder bridges were constructed. The old road had a pavement only 15 feet wide and had 32 curves, many of which were excessively sharp; the new alignment has only 11 curves and they are all easy to negotiate at modern speeds.

ROUTE SHORTENED

South of Santa Maria 15.7 miles of new cement concrete highway is now rapidly nearing completion. This project has involved the relocation of the route between Los Alamos and Santa Maria through the Solomon Hills via Solomon Canyon, reducing the distance by five miles and is a pronounced improvement in line and grade to

(Continued on page 40)

TRIBUTE TO HIGHWAY MEN

Though proud to say I've traveled o'er
 'Most all of our great State,
 Its many wonders I'll not here
 Describe or enumerate.

I want to speak of the highway men
 Who made my trips come true,
 Who built the roads so broad and smooth
 For me to use—and you.

They've moved great hills to straighten out
 Some very dangerous curve,
 To make the traveling safer
 For the public that they serve.

They've flattened grades, built highways new
 And widened narrow roads,
 And added noble bridges that
 Are safe for heaviest loads.

They keep the roads in good repair
 When the first hard work is done,
 That motorists all may carry on
 Their business and their fun.

So let us pause on our joyous way,
 A word of thanks let's give
 To the men who make our wonderful State
 A better place to live.

—Doris Dickson.

Second Santa Clara Water Investigation Report Published

EDWARD HYATT, State Engineer, announces release by the Division of Water Resources, Department of Public Works, of the second progress report on Santa Clara Investigation covering the period October 1, 1930, to September 30, 1931. It is a mimeographed report of 47 pages and four plates dealing with precipitation, stream flow, percolation, and ground water storage in Santa Clara Valley, Santa Clara County, California.

The Santa Clara investigation was initiated by the Division of Water Resources in January, 1930, at the request of Santa Clara Valley Water Conservation District and is of a cooperative nature, the two agencies contributing equally to the cost. It has as its object a general survey of the water resources of Santa Clara Valley and was prompted by local apprehension arising out of the continued retreat of ground water throughout the valley, the average depth to ground water having increased from 33.4 feet in 1915 to 63.4 feet in 1921, and to 97.9 feet in the spring of 1930.

The report indicates there was a further recession of 12.1 feet between the spring of 1930 and the spring of 1931, which would mean a depletion of ground water storage during the year amounting to 112,000 acre-feet bringing the total depletion since 1915 up to 712,000 acre-feet.

Data in the report indicate that precipitation throughout the valley varied between a minimum of 42 per cent and a maximum of 93 per cent of the averages for the periods of record, which of course accounts for the abnormally low stream discharge.

Safety Experts Urge Enforcement of Laws

"It is not more laws that are needed to cope with the traffic accident problem in California, but more enforcement."

This was the general conclusion reached at the recent convention of the California Committee on Public Safety held in Santa Cruz, when traffic experts and State, county and municipal officials assembled to seek a remedy for the rising toll of traffic deaths and injuries on city streets and State highways.

Some of the highlights among the results of the convention's deliberations were:

Intensified enforcement of the law is needed; there must be a greater certainty of adequate punishment for offenders.

Traffic tag "fixing" or "squaring" was denounced by a resolution.

A stricter examination should be given to those seeking a license to operate a motor vehicle.

There should be more licenses revoked for persistent and flagrant violations of the California Vehicle Act, and the powers of the Motor Vehicle Department should be extended in this respect.

The careless use of speed causes more accidents than speed itself.

Continuous streets designated as boulevards and protected by boulevard stop signs are of doubtful value from the standpoint of safety.

COAST ROUTE PROJECTS RUSHED TO FINISH

(Continued from page 39)

the old road via Oreutt. The improvement includes a 320-foot steel and reinforced concrete bridge across San Antonio Creek about one mile north of Los Alamos.

The last unit in the reconstruction of the highway through Gaviota Canyon between Gaviota and Las Cruces in Santa Barbara County has been completed with the opening to traffic of the new reinforced concrete arch bridge across Gaviota Creek. The new bridge has replaced a structure built in 1916 on an inferior alignment before the requirements of modern traffic were realized.

In Ventura County two new bridges have just been completed on this Coast Route. The one, a 120-foot reinforced concrete girder structure, across Calleguas Creek near Camarillo and the other, a steel deck plate girder bridge 1806 feet long, across the Ventura River near Montalvo.

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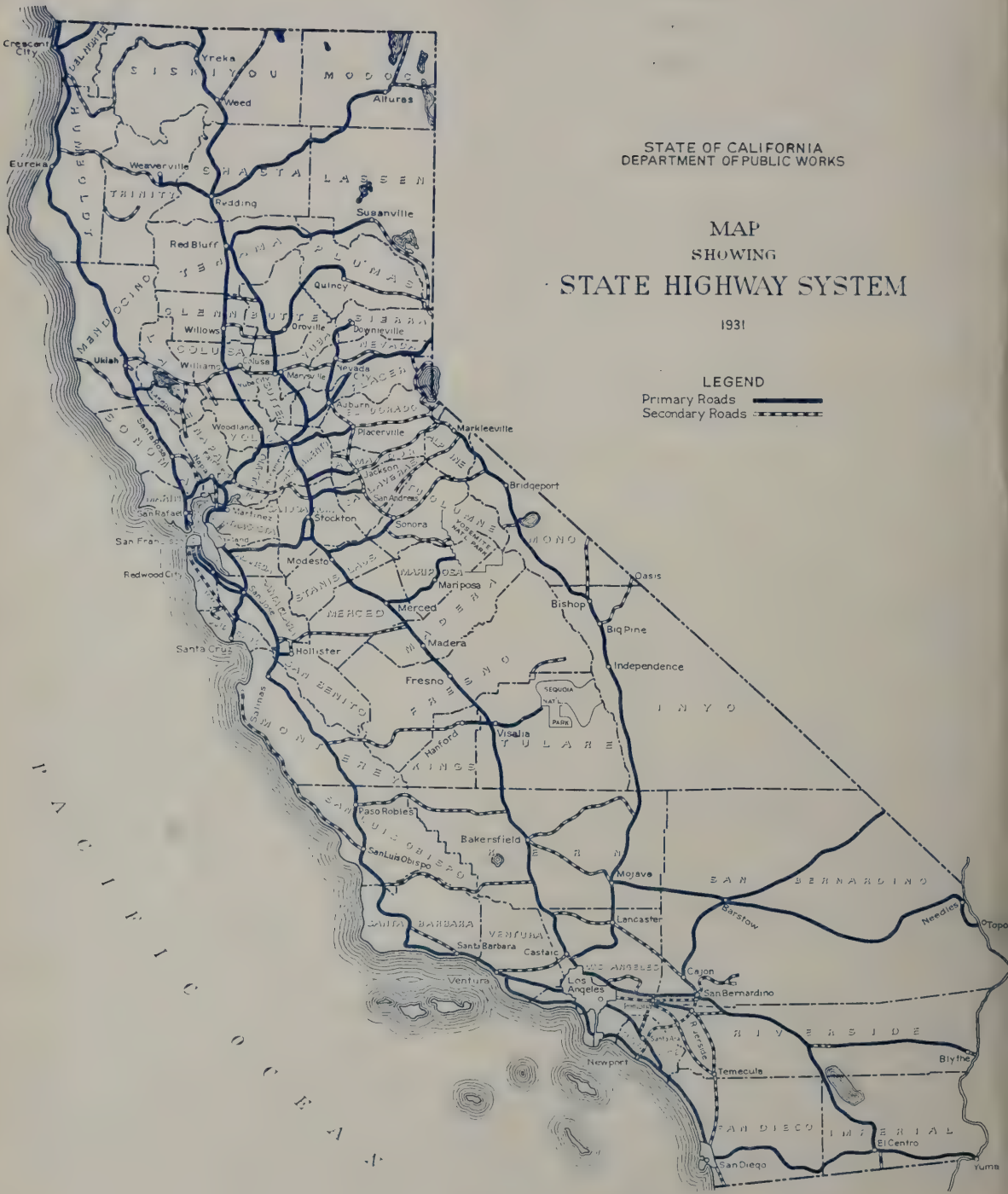
DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample

JUL 15 1931



STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

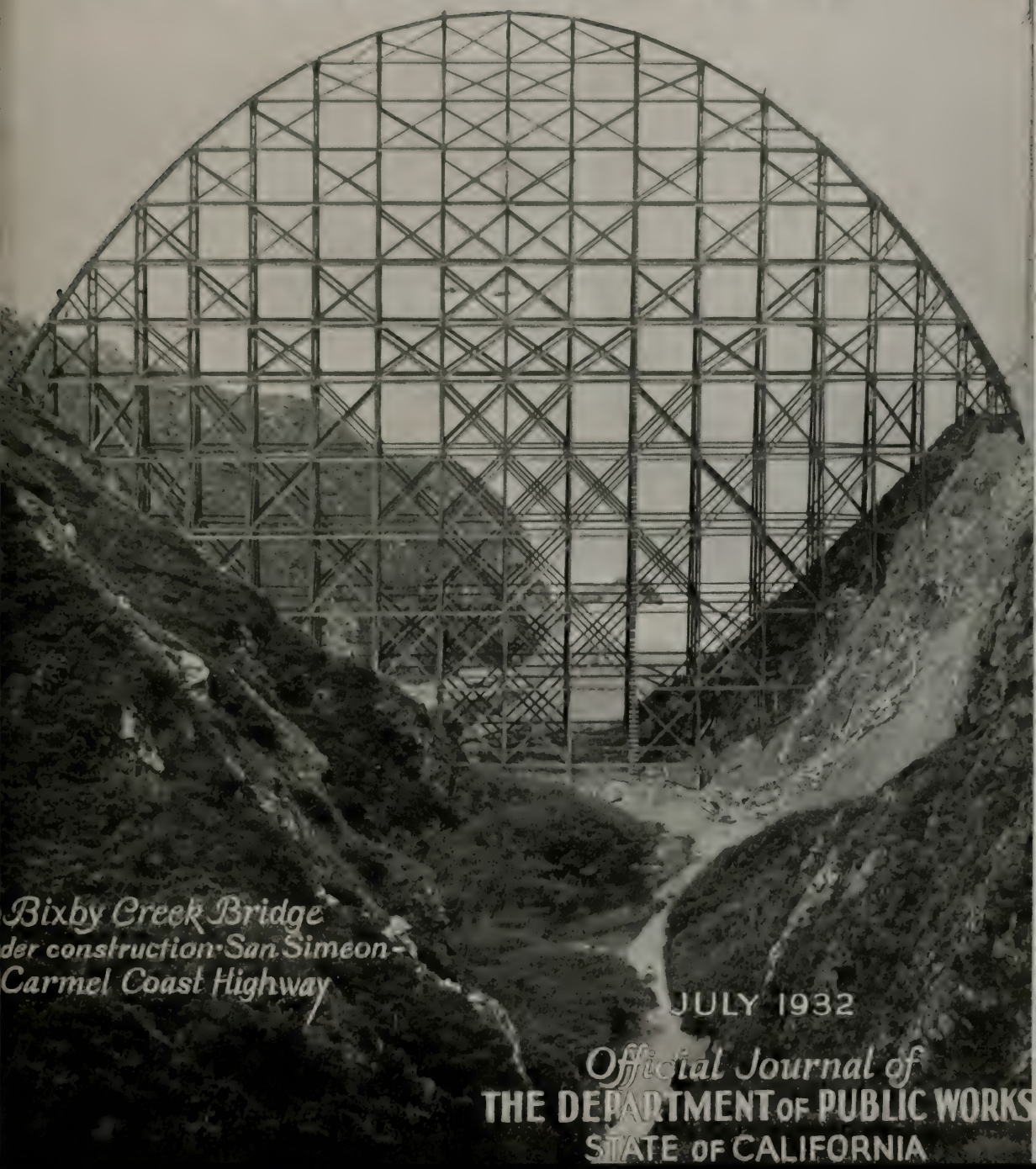
MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND
Primary Roads ———
Secondary Roads - - - - -

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CALIFORNIA HIGHWAYS and PUBLIC WORKS



*Bixby Creek Bridge
under construction San Simeon -
Carmel Coast Highway*

JULY 1932

Official Journal of
THE DEPARTMENT OF PUBLIC WORKS
STATE OF CALIFORNIA

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\$24,030,500 of Road Work Finished or Under Way in First Half of Year

Semiannual Report Shows 63 Per Cent of Highway Division's
Biennium Program Accounted for in Going Contracts
Carrying Millions of Dollars to Labor

By COLONEL WALTER E. GARRISON, Director of Public Works

IN THE Highway Division of the Department of Public Works steady progress on the biennium program has been maintained. An examination of the figures show that this progress on projects, as set forth in the Governor's budget for highway construction during the 83d-84th fiscal years, is well advanced. Figures compiled as of July 2, 1932, show that with 50 per cent of the biennium passed, work amounting to 63 per cent, or \$16,828,900 of the adjusted budget of \$26,896,600 has been put under way.

The monetary totals for the first six months of the current calendar year are as follows:

Construction and reconstruction	\$10,139,200
Maintenance	3,172,700
Balance to complete work carried over from 1931	10,718,600
Total	\$24,030,500

In addition to the above, there were calls for bids out on June 30, covering improvement to 26.5 miles of State highway, estimated to cost approximately \$1,009,400, making a total of \$25,039,900 in construction and maintenance work under way or set in motion during the first half of the year.

143 GOING CONTRACTS

The number of going contracts on June 30 was 143, consisting of 118 road construction contracts and 25 for the construction of bridges and grade separations.

The following summary presents a picture of the type, mileage and amounts of work let to contract from January first to June 30th, inclusive:

Type	Miles	Amount
Portland cement concrete pavement	69.9	\$2,294,900
Asphalt concrete pavement	35.3	1,261,000
Bituminous treated crushed gravel or stone surfacing	111.1	1,990,300

Type	Miles	Amount
Untreated crushed gravel or stone surfacing	3.0	\$94,000
Graded roadbed	42.6	1,630,400
Oiling roadbed and shoulders to alleviate dust nuisance	1350.5	539,800
Bridges	(14)	561,800
Minor improvements, etc.	----	1,767,000
Total	-----	\$10,139,200

ADVERTISED FOR BIDS

The \$1,009,400 in projects for which advertisements were outstanding on June 30th are classed according to the following tabulation:

Type	Miles	Amount
Portland cement concrete pavement	10.5	\$543,200
Bituminous treated crushed gravel or stone surfacing	16.0	311,800
Bridges	(1)	135,400
Minor improvements, etc.	-----	19,000
Total	-----	\$1,009,400

The improvement to State roads represented in the above statement includes construction or maintenance work in every county of the State. It is a matter of satisfaction to record that, despite the general business depression, the vigorous momentum of the department has been maintained, carrying with it the distribution of millions of dollars to labor and in the stimulation of business; and the orderly program for highway development has been followed as set forth by the mandate of the Legislature.

111 BUILDING PROJECTS

For the six months following January 1, the Division of Architecture had 111 going projects under construction in the field, representing a total construction value of \$3,800,000. As much of this work was contracted, no accurate figures as to the number of men given employment on these building projects is available.

(Continued on page 8)

First Coast Traffic Circle-Subway Improvement Completed at Fresno

By **WALTER BEUTHEL**, Assistant Highway Engineer

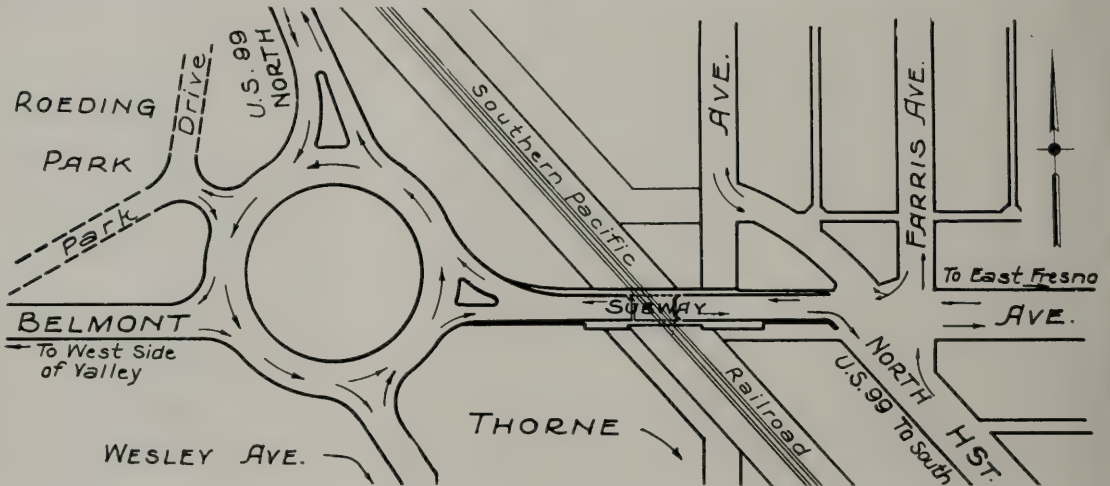
THE BELMONT SUBWAY and Traffic Circle just completed at the north entrance to Fresno is a cooperative project in which the State of California participated together with the Southern Pacific Railroad Company, the city of Fresno, and the county. The portion of U. S. No. 99 which includes the site of the improvement was constructed and maintained as State highway for a number of years but relinquished to the city in 1927.

State participation in the project was made possible through an act of the Legislature as set forth in Statutes of 1931, chapter 807,

the railroad icing and classification yards two miles to the north.

For several years Sunday traffic counts during the summer on Belmont Avenue at the subway site reached 11,000 vehicles in 16 hours. About 5000 of these vehicles used the State route north, the balance entering the adjoining city park or the county paved highway.

The traffic circle, in combination with the underpass, is believed to be the first actual construction of this plan on the Pacific coast, although many instances of similar devices for traffic control have been built in the East-



and in this case involved cooperation in improvement of the "Golden State Highway" through Fresno.

The underpass beneath two tracks of the main line of the Southern Pacific's valley route removes a definite traffic hazard and a source of frequent delay to the users of the State highway and the county highway east and west and the city connection with Roeding Park.

TRIPLE TRAFFIC FLOW

Heavy automobile and truck travel on these roads is seasonal and coincides with frequent movement of fruit trains together with considerable switching across Belmont Avenue to

ern States. New Jersey in particular has done much in the way of adapting the traffic circle plan to the most varied and complicated situations presented in a highly developed territory.

DIFFICULT PROBLEM

The traffic circle was adopted by the city of Fresno as a solution of the traffic problem for the Belmont Avenue crossing after conferences with traffic experts and it appeared to be the best solution of a difficult problem.

The movement of vehicles at the intersection of two main routes and several intersecting roads is confined to one direction with

(Continued on page 27)



A TRIPLE TRAFFIC THREAT at the north entrance to the city of Fresno that occasionally materialized in accidents and blocked highways has been ended by the completion of this combination plan of traffic circle and subway shown under construction in the above photograph. A railroad crossing, the Golden State Highway and a main east and west paved county highway were involved in the problem, together with an entrance to a city park. The subway under the Belmont Avenue railroad crossing obviates hazard and delay from train movements and the circle keeps the intersectional traffic flowing in one direction with only right hand turns and no possibility of entanglement.

Alternate Ridge Route Completion Will Mean \$1,369,000 Annual Savings

By shortening the distance between Los Angeles and Bakersfield nearly ten miles, the Ridge Route relocation will save motor traffic \$867,000 annually in straight operating costs as compared with the present route. Its easier grades and fewer curves reflect another lowered power cost of \$392,000, while the reduced driving time figures an additional \$110,000 expense economy for commercial vehicles. From an engineering standpoint it is a prodigious undertaking of which many interesting details are given in the following article by District Engineer S. V. Cortelyou who is in charge of the project.

By S. V. CORTELYOU, District Engineer

THE RIDGE Route Alternate highway, now under construction in Los Angeles County, on the route connecting the San Joaquin Valley and southern California, is one of the largest and most important projects ever undertaken by the State Highway Department.

In order to grasp the underlying reasons for this enterprise it is necessary to go back to the early days of the State Highway Department in 1912, when the problem was being considered of determining the most direct and practicable route for a main trunk highway to connect the San Joaquin Valley and southern California.

Two principal routes were under consideration at that time. One of these was the so-called Tehachapi Route, extending easterly from Bakersfield through Tehachapi and Mojave, thence through Antelope Valley and Mint Canyon to Saugus. This route was substantially that followed by the Southern Pacific Railroad and involved comparatively light construction.

FIFTY MILES SHORTER

The other route, known as the Ridge Route, followed Tejon Pass and was a much more direct line, being about 50 miles shorter than the Tehachapi Route. A large portion of the Ridge Route was across extremely rough mountainous country which would involve correspondingly high construction costs. The problem at that time was to locate a highway if possible along the shorter route and at the same time make the location so that the road could be built with the limited funds available for the purpose.

The Ridge Route, following the most readily traversible and least expensive location on this general route was surveyed and finally adopted and built. This highway was considered one of the most important links in the State highway system.

It was a great achievement in highway construction, principally on account of what was considered at that time the enormous amount of excavation involved. It conformed to the recognized standards of alignment and grade of that time. It was 50 miles shorter than the shortest alternate route. On its completion the run from Los Angeles to Bakersfield could easily be made by automobile in less time than was required by the fastest limited train.

TRAFFIC INCREASED

A tiny stream of traffic formed, interrupted only occasionally when deep snows in the higher mountains temporarily blocked the road. This stream of traffic gradually increased in size as tributary roads were built and the use of automobiles increased.

With the increase in number and general usage of automobiles came increased speed of travel. Some of the sharper curves on the Ridge Route were found to be dangerous and were improved by "daylighting" and finally by removing the points. These formed crescent shaped areas with the original pavement. A number of these areas were paved with light bituminous type pavement and these improvements increased the safety of the road to a considerable extent.

This work of improving alignment on the worst curves was started in 1924 and the

(Continued on page 16)



PIRU GORGE, shown from the air, was a tough spot for planners of the new Ridge Route.

A. Frenchman's Flat where highway swings up Oso Creek.

B. Concreted channel change saving two bridges.

C. Large cut involving excavation of 225,000 cubic yards.

D. Temporary construction road.

E. Completed road in Liebre Canyon.

F. Location of Piru Creek just above the junction with Liebre Canyon.



"HIGH, WIDE AND HANDSOME" the motorist will speed over the broad easy grades of the Ridge Route Alternate when it is opened the latter part of this year. No. 2 picture shows a portion of the completed roadway five miles north of Castaic. No. 3 shows the grading and heavy construction in Liebre Canyon five miles north of the junction with Piru Creek. No. 4 is a view of the "Big Cut" and the road up the gorge behind it. The cut is 206 feet deep on the center line and 400 feet long. The power shovel is 38 feet above grade. The two gopher holes shown in the cliff below it are on grade. Gopher holes and down holes were used in blasting with 60 per cent dynamite.

Twenty Years of California Highway History—An Anniversary Retrospection

By **EARL LEE KELLY**, Chairman California Highway Commission

LOOKING back twenty years in California's highway history, we find the first California Highway Commission starting the first work under the first contract to be financed by the first State highway bond issue.

That historic event occurred on August 7, 1912, when Burton A. Towne, the first chairman of the commission, turned the first shovelful of earth on the Coast Highway in San Mateo County between San Francisco and Burlingame, thereby beginning the development of California's splendid system of highways, including more than 5500 miles of surfaced roads and representing an expenditure of more than \$200,000,000.

The pioneer highway commission faced the herculean task of building \$50,000,000 worth of highways with \$18,000,000 bond issue funds as, if, and when the bonds could be sold for par at the low interest rate of four per cent. They labored mightily and well, setting the compass and charting the course for all highway commissions that have followed.

GIVEN WIDE POWER

Burton A. Towne of Lodi, Charles D. Blaney of Saratoga, and N. D. Darlington of Los Angeles were the members of the first commission. They were charged under their appointment by the Advisory Board of the Department of Engineering, and Governor Hiram W. Johnson, with wide jurisdiction and powers, to wit:

1. To take full charge of the entire matter of the construction and acquisition of a system of State highways in and for the State, as and in such manner provided by law, at a cost not to exceed in the sum of \$18,000,000 under and in pursuance of the Act of the Legislature of the State of California approved March 22, 1909, and known as the State Highway Act and to do and perform as fully and completely as may be done by any part, or representative, or committee of this Advisory Board, every act and thing that may be requisite to be done and performed in connection with the highways of the State of California or that ought to be done and performed under the said State Highway Act.

2. To do and perform every act and thing in and about the premises that a committee of this board may be lawfully authorized to do for or on behalf of this board; and to have full charge and

control of the acquisition and construction, of the laying out and the building of a system of such highways.

3. To report from time to time to this board their actions and proceedings and to submit to this board for determination such matters as the law requires this board to act upon and to superintend the work and operations of the Highway Engineer whose appointment is provided for by the act of the Legislature of the State of California, approved April 8, 1911.

4. To perfect such organization as they may deem necessary to carry on with celerity and efficiency the work to be done in the matter of the acquisition and construction of the said system of State highways, and under said State Highway Act; and generally to do all and singular every act and thing that may be necessary for the due, speedy and efficient performance of all that may be required under the said State Highway Act, and under the Act of the Legislature of the State of California, approved April 8, 1911.

In planning a State road system the Highway Commission was allowed ample latitude as to route, the provision of the statute being that:

INCLUDED COUNTY SEATS

"The route or routes of said State highways shall be selected by the Department of Engineering, and said routes shall be so selected and said highways so laid out and constructed or acquired as to constitute a continuous and connected State highway system, running north and south through the State, traversing the Sacramento and San Joaquin valleys and along the Pacific coast by the most direct and practical routes, connecting the county seats of the several counties through which it passes, and joining centers of population together with such branch roads as may be necessary to connect therewith the several county seats lying east and west of such State highways."

The commission started promptly to work after their appointment on August 8, 1911, sent survey parties out, divided the State into seven districts with an engineer for each district, made many momentous decisions, including the selection of concrete pavement for the State system, with the result that in less than a year a thousand miles of highway had been surveyed and actual construction begun, with only about a third enough money to do the job.

A second bond issue of \$15,000,000 was passed in 1916, and the Legislature added about \$10,000,000 additional roads to the system. The World War followed and halted

(Continued on page 14)



TWENTY YEARS AGO on August 7, 1912. Chairman Burton A. Towne of the first California Highway Commission turned the first shovelful of earth on the first State highway contract. The scene is reproduced from the book "California Highways" by Ben Blow, field secretary of the National Automobile Club.



CARRYING ON TODAY, members of the present California Highway Commission, serving without pay, come up smiling at the end of a hard day's work. From left to right: Harry A. Hopkins, Frank A. Tetley, Chairman Earl Lee Kelly, Timothy A. Reardon and Philip A. Stanton.

Dam Investments Total \$149,048,240

(Continued from page 1)

Nevertheless, it is believed that 1500 mechanics have been gainfully employed.

Since the first of the year, the Division began work on 70 projects, an average of more than 11 begun each month. The total construction value of the new projects is \$1,850,000. Several large projects have been completed. Among these are the California State Office Building in Los Angeles, the new units at Agnews State Hospital, and the California Institute for Women. These projects represent a total of \$3,000,000 and are not included in the figures heretofore mentioned.

WIDESPREAD SERVICE

In the Division of Water Resources there is a widespread service that does not always come to the attention of the public. Much of it is supervisory and also a considerable percentage of it is in cooperation with local authorities. It may be stated, however, that, in addition to the preparatory work done on the state-wide water program, much has been accomplished in service to local communities. The cooperative work has been done on the Santa Ynez, San Joaquin, San Jacinto, Pajaro and other streams.

The storage of water, as reflected by dam construction, is interesting. The total number of dams already built or under construction is 762. Dams built previous to August 14, 1929, have a storage capacity of 6,500,000 acre-feet. The new ones have a storage capacity of 813,069 acre-feet, a total of 7,313,069.

The total estimated cost of these existing improvements is placed at \$149,048,240. It is interesting to note that, of the 11 dams now in the course of construction, 9 are for municipalities or flood control districts. During the first six months of 1932, 68 applications were received for the approval of plans for repairs of dams. Ten plans for construction were received and 74 plans for repair work were approved.

ACCURATE PREDICTIONS

The diversified and intensive information necessary for the development of the state-wide water conservation plan may be illustrated by reference to the cooperative snow surveys that have been under way for several



COLONEL WALTER E. GARRISON
Director of Public Works

seasons. In the intricate relation between the use of reservoirs for irrigation, power, flood control, etc., it is essential that accurate predictions of the run-off be available, and where the snow surveys have been conducted for a considerable period, a comparison of the actual stream flow with the predictions has demonstrated most satisfactorily that a high degree of accuracy can be obtained.

The confident prediction of stream flow from the snow crop requires that the records be available for a number of years, the longer the period the better. The real value of this work, therefore, will become more evident with the extension of the record, and if carried on without a break, will prove invaluable in the great reservoir development that is proposed under the state-wide water plan.

An inspection of the records of the Division of Water Resources discloses a range of work that is indeed many sided, and with results that will contribute materially to a solution of the State's paramount problem.

How State Protects Highways Against Excessive Overloads

IN HIGHWAY work the question of design of the road section and of bridges is most important. The pavement must be of sufficient width and of a thickness that will carry traffic during a reasonably long period. The structures must have a sufficient factor of safety to allow for deterioration for a considerable period. On the other hand funds are limited and it is obviously not economical to construct improvements to provide for the occasional excessive load.

In order to protect the highways, and to allow of designs within economical limits, the Legislature has set up certain maximum limits for height, width, and weight of loads. The height and width limits establish the design limits for overhead clearances at structures and lane widths of pavements. The weight limit allows construction of a reasonable thickness of surfacing and of economical bridge design.

THREE WEIGHING STATIONS

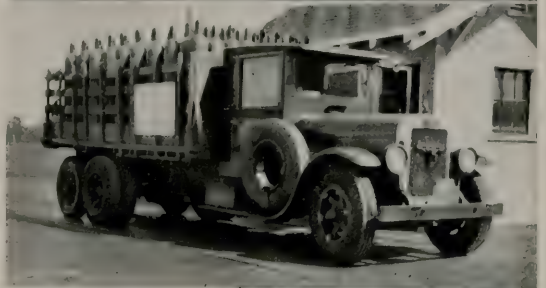
Under the law permits may be issued for overloads at the discretion of and under such restrictions as may be deemed advisable by the Department of Public Works or local officials having jurisdiction of the highways. In so far as State highways are concerned restrictions are designed to protect other traffic as well as the highways. Excessive overloads are not permitted where hazard to traffic or structures exists.

The officers of the Highway Patrol are responsible for checking up on overloads. Regular crews are assigned to this work. They are furnished with loadometers, which are small weighing units designed to weigh one wheel of the equipment at a time.

In order to assist in this work standard scales have been installed by the Division of Highways at three points on heavy trucking routes. One scale is located south of Banning on route 26 into the Imperial Valley, one at Rose Station near the Grapevine south of Bakersfield, and one at Burlingame on the Bay Shore Highway.

These scales serve to furnish a more accurate check on weights and provide a check on the tendency of some hauling outfits to "put on everything they can start," as one driver expressed it.

WATCHING AND WEIGHING



TOO HEAVY for the highways are some big truck loads so Highway Patrolmen weigh them with loadometers or check them at standard scales maintained by the State.

Financing of San Francisco-Oakland Bridge Possible Under U. S. Relief Bill

WITH Federal financing practically assured for the \$75,000,000 San Francisco-Oakland Bay Bridge project, Colonel Walter E. Garrison, State Director of Public Works, and Chief Engineer Charles H. Purcell have ordered "full steam ahead" in the completion of final designs.

The relief measure authorizes the Reconstruction Finance Corporation to loan \$1,500,000,000 to self-financing projects of public character. Under the terms of the bill the Reconstruction Corporation may loan to public agencies of States, which would include the State Toll Bridge Authority. The relief measure, as originally introduced, excluded the transbay bridge project. Chief Engineer Purcell immediately proceeded to Washington, and was successful, through the cooperation of California's congressional delegations, in having the measures amended.

A preliminary letter descriptive of the transbay bridge project as fitting the requirements of the relief measure in every possible way has already been filed with the Reconstruction Finance Corporation. This letter, signed by George T. Cameron, Chairman of the Executive Committee of the Financial Advisory Committee appointed by Governor James Rolph, Jr., points out these essential facts:

JOINS MAJOR CITIES

Two major cities of the United States—San Francisco and Oakland—with adjacent East Bay cities with populations of 700,000 in San Francisco, and over 500,000 in Oakland and adjoining cities, are separated by the natural barrier of San Francisco Bay, with only ferry service between.

The growth and commercial welfare of these bay cities has been and is greatly handicapped by the waste of time in crossing four miles of water by ferry. San Francisco is isolated on the north and east from the mainland.

This proposed bridge will make a direct connection for San Francisco to the mainland and remove this barrier. It will greatly benefit commercial life and will facilitate national defense.

GREAT TRAFFIC INCREASE

Automobile traffic across the bay, in spite of the ferry handicap, has rapidly increased during the past ten years. In 1915 364,000 vehicles crossed the bay. By 1930 this number had increased to 4,500,000. Conservative estimates indicate that by 1937—when this bridge can be completed—the traffic will have increased to 8,000,000 vehicles.

In addition, 35,000,000 commuters cross the bay every year. The bridge will save each automobile approximately thirty minutes per trip, and each commuter fifteen minutes per trip. Based on the present rate of tolls, this project will earn, on conservative traffic estimates, an average of from 1.6 to 2 times the interest requirements over the first five years of operation, depending on the rate of interest and necessary bond discount. After five years, due to the cer-

tain increase in traffic, this earning power will increase. Conservative traffic estimates indicate that, on six per cent net interest return, this project will be fully amortized in from 22 to 25 years. If money can be obtained at a lower rate, the period of amortization will be proportionately reduced.

LARGE SAVING POSSIBLE

If this project can get under way in the immediate future, a great saving can be made in the cost of construction due to the low market values of materials. A lower capital investment will increase the future net earning power of the bridge, and will fortify the financial integrity of this project.

The proposed bridge is approximately seven and one-half miles long from end to end of approaches. The main structure extends from the San Francisco shore over the West Channel to Yerba Buena Island, thence over this island and the East Channel to the Oakland shore.

The West Channel crossing consists of twin suspension bridge with central spans of 2310 feet. The East Channel crossing consists of a 1400-foot span cantilever bridge with five 500-foot steel spans and fourteen 290-foot steel spans approach.

DOUBLE DECK TYPE

The roadway is of the double deck type with 57-foot roadway on the upper deck accommodating six lanes of fast automobile traffic. The lower deck carries a 30-foot roadway for three lanes of truck traffic and two interurban electric tracks.

The bridge is to be constructed under State authority by the Department of Public Works of the State of California, the State Toll Bridge Authority being the fiscal agency which was authorized by the 1929 Legislature to issue income bonds secured by tolls for the construction of this and other worthy bridge projects. These laws have been referred to the Supreme Court of California and have been declared constitutional by unanimous opinion of this court.

The plans have been approved by the War Department of the United States, and a permit has been given by it, through consent of Congress, to build the bridge.

EMINENT CONSULTANTS

The bridge is being designed by engineers of the Department of Public Works of the State of California, in cooperation and constant consultation with a board of eminent consulting engineers. Mr. Ralph Modjeski is chairman of this board, and Messrs. Moran and Proctor, Leon S. Moisseiff, H. J. Brunnier, and Professor Charles Derleth, Jr., are members. All of these men are of the highest qualifications obtainable in bridge engineering.

Very extensive foundation borings have been completed, with the result that excellent foundations are known to be available.

Foundation and superstructure plans have advanced to such a point that the first contract for foundations can be advertised by the middle of August, 1932, if the money is available; this contract to be followed by others as rapidly as possible.

Widespread Stimulus to Employment

(Continued from preceding page)

This project will employ locally on the average of 6000 men over a period of three and one-half years, with approximately 4000 men in other parts of the United States at steel mills, lumber mills, and equipment manufacturers. No estimate can be made of the added employment due to the general stimulating effect of this project.

STIMULATES INDUSTRIES

The materials required are approximately as follows: 160,000 tons of steel, which will be for the most part, if not entirely, rolled and fabricated in the eastern states from ore obtained in Michigan and handled by ships on the Great Lakes. The fabricated steel will be hauled across the continent by rail, or by water through the Canal; 200,000 gallons of paint

Construction can be started at an early date and, in consequence, will afford quick relief.

The estimated cost of construction contracts is \$60,000,000, to which must be added interest during a construction period of from three and one-half to four years, together with other charges amounting to approximately \$15,000,000, depending upon interest rate, discounts, etc., making a probable total capital expenditure of \$75,000,000.

The project is financially sound and self-liquidating within a reasonable period of time.

A PUBLIC NECESSITY

It is a public necessity in the welfare and development of the bay cities and northern California, and an aid to national defense in war.



THE EAST CHANNEL CROSSING of the San Francisco-Oakland Bay Bridge project consists of a 1400-foot span cantilever bridge with five 500-foot steel spans and fourteen 200-foot steel span approaches. It will carry an upper and lower deck with 57-foot roadway on the upper deck to accommodate six lanes of fast automobile traffic and a 30-foot roadway on the lower deck for three lanes of truck traffic and two interurban electric tracks.

will stimulate the paint industry; 40,000,000 to 50,000,000 B.M. of lumber will greatly stimulate the lumber industry in Oregon and Washington.

One and one-half million barrels of cement will operate the cement mills of California for a considerable time. One million cubic yards of concrete aggregates will constitute the full capacity of the local aggregate plants for a long period.

Construction equipment on a large scale will be required and will, in consequence, have a stimulating effect on equipment manufacturers in other parts of the United States. Forty thousand to 50,000 tons of reinforcing steel will further stimulate the steel and transportation industries.

WORK WIDELY DISTRIBUTED

In general, this project can not be considered as local in its character. The materials required in its construction and the labor used in its manufacture is widely distributed over the United States.

It will be a publicly owned bridge, subject to tolls until amortized, and then free.

It is being designed by the State of California under the guidance of the world's most able and eminent engineers, and has been declared by them to be structurally and economically sound.

LEGALLY SOUND

The laws under which it is to be constructed have been declared constitutional by the Supreme Court, and its construction has been approved by the Department of War.

It has the unanimous approval and support of the entire population of northern California, comprising over 2,500,000 people.

By act of the California Legislature, the Department of Public Works is empowered to make this bridge a part of the State Highway system and to provide funds from its revenues from the gasoline and motor vehicle taxes to maintain the bridge when completed.

Traffic Hazard on Trinity Lateral Removed by Water Level Relocation

By **E. J. BASSETT**, District Office Engineer

WITH the opening to traffic of the Canon Creek bridge at Junction City in Trinity County on June 25, one of the hazardous barriers to traffic, on the Trinity Lateral (State route No. 20) between Redding and Eureka, was removed. The opening of this structure made available for use 4.76 miles of newly graded and oiled highway and eliminated for all time one of the most narrow and dangerous stretches of road on the entire route.

The primary purpose of Route 20 between Weaverville and Eureka was to provide a cross connection between the coast and the interior valley trunk line highways, as well as a connection between the county seats of Humboldt and Trinity counties. Due to topographic and climatic conditions, the Trinity River route was chosen as the most practicable after comparisons and consideration of other locations.

Prior to 1923, Trinity County had no connection to the coast by way of the Trinity River and no road of any kind west of Helena. Very difficult mountain roads led in from the east to Helena and from the west to Salyer, leaving a gap of 40 miles along the rugged Trinity River Canyon which was accessible only by pack train.

STARTED IN 1919

Construction work on this gap was started in the spring of 1919 and was completed five years later, both the State and the U. S. Bureau of Public Roads participating. The construction work was of a low character but was to standards consistent with this class of highway in that period of development. Construction between Valdor and Weaverville was, however, delayed for several years, pending the completion of other more important

sections of this route, and it was not until December, 1930, that operations were again resumed, the availability of convict forces which had been elsewhere engaged making it possible.

Following the completion of the highway over Buckhorn Summit in Shasta and Trinity counties on this route it was found expeditious to continue construction activities on other portions of the route where the old county road was still in use.

The section of old road between Valdor and Junction City was a particularly difficult one, owing to its narrowness, its steep and adverse grades and many sharp and difficult curves. Following along Canon Creek for two miles, it rose abruptly, passed through a saddle high above the Trinity River and continued climbing for another mile along the less precipitous and more earthy slopes of the mountain, in effect, following the line of less resistance in cost. It then followed a general descent to Valdor, near the end of the project, traversing a distance of 5.1 miles.

SCENE OF ACCIDENTS

Since 1926 this section has been under State maintenance, and minor improvements and betterments re-

duced the ordeal to traffic to a considerable degree. Nevertheless, intelligent driving was the essence of safety, and inattention to the rules of safe driving has contributed to the toll of serious and fatal accidents.

The new location follows the east bank of the Trinity River on a water grade. Except for four exceptionally heavy bluffs, the work is moderate, considering the mountainous character of the locality. While this location is not materially shorter than the old road, the absence of adverse grade is one of the



E. J. BASSETT



IT WENT BOOM and 10,250 yards of solid rock were torn from this bluff and hurled into the Trinity River.



NOW IT'S FINE level highway, no bluff, cutting out a steep mountain climb between Valdor and Junction City.

most outstanding features of the improvement.

A comparison of the roadbed width is, of course, beside the point, as the new construction has a width of 24 feet while the old road is barely wide enough at many points for passing at slow speeds. The element of danger has been eliminated so far as is possible in modern, up-to-date construction, and the maximum legal speed may be maintained over the entire unit.

IMPROVEMENT EXTENDED

Work was inaugurated on this project in December, 1930. The original plan contemplated the construction only of the Valdor-Junction City section. A later addition ex-

tended the work to Oregon Gulch, east of Junction City, with a temporary connection to the existing road, approximately three-fourths of a mile in length. This new construction will be completed in September of the present year, but all except 0.6 mile is in use at the present time.

The work involves the removal of 280,000 cubic yards of excavation, the greater portion of which is encountered in four rock bluffs rising precipitously from the water's edge of the Trinity River. One of these, immediately below Junction City, is probably the most extensive, containing 54,000 cubic yards in 0.47 of a mile of distance.

An interesting feature of the construction of this bluff was the loading and shooting of

(Continued on page 28)

Rolph's Prophecy Becomes a Reality

(Continued from page 6)

highway work almost entirely in many states, though not to that extent in California. But in 1918 the California Highway Commission again needed funds to carry on and another bond issue was necessary.

ENCOURAGED BY ROLPH

With the aid of the State Association of Boards of Supervisors, the automobile clubs, various chambers of commerce and road booster organizations, a committee was formed that met in the San Francisco City Hall on February 12, 1919, to decide on a program to present to the Legislature.

They were greeted and encouraged by Mayor James Rolph, Jr., of San Francisco, who 11 years later as Governor of this great State was to appoint and encourage the present California Highway Commission. He told them that California needed more and better highways, that the completion of the system meant much to the prosperity of the State and the happiness of its people, and that he thoroughly believed in and espoused their cause. His words, a mere prophecy then, are an actual reality today.

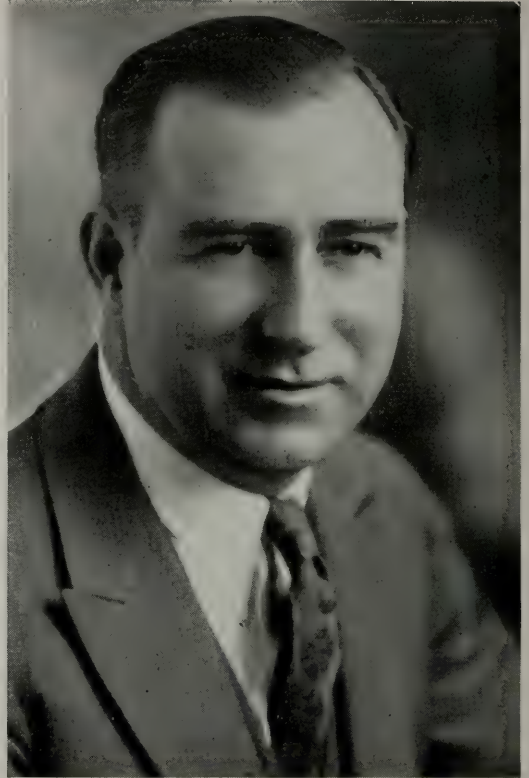
The committee thought a \$20,000,000 bond issue would be sufficient to finish up the system, but after three days of deliberation and discussion of the various roads presented and vigorously urged, they concluded that at least \$40,000,000 would be necessary. The convention's conclusion and request were presented to the Legislature and the bill passed.

By 1920, 1500 miles of concrete pavement had been laid and still the State system was far from complete. Three State bond issues had totaled \$73,000,000. Long term bonds were issued.

In the amortization of these bonds our taxpayers eventually will have paid approximately one hundred fifty-two millions of dollars. In other words, the interest through the years will amount to more than the principals of the three bond issues.

NEW TAX PLAN

While the people of California had been responsive to these three bond issues, yet the knowledge was dawning upon them that



EARL LEE KELLY

through a newly developing form of taxation, namely, the gasoline tax, huge savings would be made possible through the adoption of a "pay as you go" system.

In 1923 the first gas tax was passed by the Legislature of California, which provided for a two-cent license tax for each gallon of motor vehicle fuel sold for use by motor vehicles in the State. This measure provides for a refund of the tax where the motor vehicle fuel is used for purposes other than in motor vehicles.

A "motor vehicle fuel fund" was created.

One-half of the moneys accruing from the two-cent tax remaining in this fund, after the refunds mentioned have been paid, is distributed among the counties to be expended for road purposes by the local authorities. The other half accruing from the two-cent tax is paid into the "State Highway Maintenance Fund," but only for main-

Fuel Tax a Pay-As-You-Go System

(Continued from preceding page)

tenance and reconstruction purposes, and it is so allocated by the Highway Commission.

ANOTHER CENT ADDED

In 1927, realizing that moneys provided by bond issues for the construction of the State highways had become exhausted, the Legislature duly passed two measures, which inaugurated in our State a new era of State highway building on a "pay-as-you-go" basis, and with adequate funds in sight for a complete, coordinated and comprehensive plan of operations covering a period of years.

The first measure was an act providing for an additional one-cent gasoline tax to be used exclusively for the construction of State highways. This measure had no effect whatsoever on the previously existing two-cent gasoline tax, half of which goes to the counties and the other half to the State.

Another outstanding measure passed by the 1927 Legislature is known as the State Highway Classification Law. This has provided for the distribution of the State's share of the receipts from the motor vehicle fuel tax acts, in an equitable manner between the northern and southern sections of the State.

HUGE SAVINGS MADE

Further illustrating the savings effected by a "pay-as-you-go" plan, the cost of new State highway construction budgeted in the 1929-1931 biennium totaled \$27,400,000. If this had been paid from the proceeds of 4½ per cent bonds maturing in 40 years, the cost of the same projects would be \$51,272,250.

It has been aptly stated: "The wisdom of the Legislature of California in proposing and enacting a tax on gasoline, which all users of the highways pay in proportion to their enjoyment of the benefits of these good roads has been amply demonstrated."

The experiment has been so successful, the tax so easy of collection, the fairness of it so universally conceded, and the saving so great over the previous method of financing, it is most improbable that the people of California will ever revert to the issuance of interest-bearing securities for an enterprise of this character, particularly in light of better popular understanding of the facts.

In California, therefore, we feel that we have been quite fortunate in the following accomplishments:

RESULTS ACCOMPLISHED

1. New State highway construction through the three-cent gasoline tax.

2. The application of the budget system to State highway expenditures, through which the public is now informed of the manner in which it is proposed to spend State highway money in advance of and not following such expenditures.

3. The adoption of a definite and orderly policy governing the extensions of the State highway system.

4. The construction of 5575 miles of improved roads out of a total of 7389 miles for the entire system, representing a total investment of \$257,685,620.

Thus we look back 20 years ago to that fine group of highway commissioners who pioneered the first roads in California, and it is our hope and sincere wish that we who have been appointed by Governor Rolph to carry on shall not be found wanting, but shall continue the fine work of those distinguished pioneer road builders, striving always constantly to improve this great highway system which has been given into our charge and keeping.

\$258,000,000 TAX INCREASE

The one-cent per gallon tax on gasoline and various excise taxes on automotive products, provided by the new federal revenue bill will exact approximately \$258,000,000 a year from automobile owners and users of highway transport in the United States, according to the Automobile Club of Southern California. This sum amounts to 23 per cent of the \$1,118,500,000 in new or increased taxes levied by the revenue bill to balance the national budget.

ATTRACTIVE ROADSIDES

Reasons for the growing interest in roadside development work are numerous and practical. Some of the more apparent benefits may be listed at random as follows: attractive roadsides encourage recreational use of highways and the public land and help develop a sense of community pride; roadside control makes travel safer by revealing hazards, eliminating obstructions to vision and reducing fire danger, to name only a few safety benefits; erosion may be eliminated by planting and seeding slopes and embankments.—*Better Roads.*

Striking Feature in Ridge Relocation

(Continued from page 4)

State maintained a power shovel and small crew on this work until June, 1930. The crescent-shaped areas formed by the grading work were paved in several small contracts.

BECOMING OBSOLETE

In the meantime the tiny stream of traffic which started in 1916 became a larger stream, constantly increasing in volume and speed. Curves which were gradual enough for the slow moving traffic of 1916 were too sharp for the fast moving traffic of 1929. Pavements which were considered wide enough and thick enough at the earlier date were inadequate for the greatly increased volume of traffic and loads of the latter time.

The Ridge Route has been a wonderful road and has served its purpose well. It had saved its cost many times over in providing the fastest and most direct highway outlet from northern California and the San Joaquin Valley to southern California.

But standards of highway design and construction were constantly improving. This highway which was modern in design in 1916 was becoming obsolete. It was like comparing the automobile of 1916 with the car of 1932. Your 1916 model was a satisfactory vehicle in those days and served you well, but it could not be compared to the trim, swift, smooth-running automobile of 1932. The design of highways has improved fully as much as the design of motor cars. One could not now be satisfied with the mountain highway of 1916 any more than with the motor car of 1916.

MORE DIRECT ROUTE

It became increasingly evident that the Ridge Route would have to be either reconstructed or replaced. With the increase in revenue derived from the gas tax it seemed probable that a more satisfactory though more costly route could be found.

Several reconnaissance surveys were made, following shorter routes. The one which promised the most permanent location was one which extends in nearly a direct line from Castaic School at the southerly end of the present Ridge Route, to Gorman, near the Kern County line. This new line lies to the west of the present Ridge Route the entire distance. In 1929 a survey party started the actual survey and location of the Ridge Route Alternate which is to replace the present Ridge Route. It follows a lower line through Violin Canyon and Piru Gorge.

Following are comparisons of a few features of design of the two routes:

Items	Unit	Old Ridge Route	New Ridge Route Alternate
Length	Miles	36.45	26.85
Total curvature	Degrees	35141	2492
Highest elevation	Feet	4234	3550
Minimum radius of curves	Feet	70	1000
Maximum grade	%	6% uncompensated	6% compensated for curvature
Total rise	Feet	4630	3450
Adverse grade	Feet	2220	1040
Roadbed width	Feet	21-24	38
		Original contract	

Surveys demonstrated that the new route had so many advantages over the old one that all thought was given up of reconstructing the highway on the old route.

Perhaps the most striking features of this comparison are:

1. The new route is 9.6 miles shorter than the old.
2. It has only about 1/14 the total curvature of the old.
3. The new route has a minimum radius of curvature of 1000 feet as compared to a minimum radius of 70 feet for the old route as originally constructed. This high standard of alignment will permit all curves to be safely driven at high rates of speed.

WIDER ROADBED

In addition to the above important features is the wide roadbed of the new route which has been designed to permit widening as future necessity arises. The adverse grade has been reduced by 1180 feet. This is equivalent to a reduction in that much climb on steep grades and sharp curvature along the present highway.

The highest elevation attained on the new road will be 684 feet lower than the highest elevation on the old route. The average elevation will also be considerably less so that interference from snow will be appreciably lessened.

Maximum grade will be six per cent as on the present route except that it will be compensated for curvature and broken by long stretches of minor grade.

In 1929 when the study of the alternate route was being made, the average daily traffic over the Ridge Route was about 2100 autos, 200 trucks and 620 tons of freight. Based on increases in volume of traffic for several years it was predicted that during the next ten years average traffic would conservatively be 175 per cent of traffic at the time the study was made. The average daily traffic for the ten year period was therefore estimated as 3600 autos, 350 trucks and 1100 tons of freight per day.

BIG ANNUAL SAVINGS

Some startling figures on the saving of the new route were derived on this basis. Assuming a cost of 6 cents per ton mile for hauling freight, 4 cents per mile for operating an auto and 25 cents per mile for moving buses and empty trucks, shortening the distance by 9.6 miles, will effect an annual saving of \$867,000 to users of the road.

(Continued on page 26)

“Devil of the High Sierras” Discovered in Lava Rock Profile

By E. M. MUSE, Delineator, Highway Department

AT AN elevation of about 8500 feet, jutting from the end of an ancient lava flow near the Alpin State Highway, was found a marvelous freak of nature. Overlooking Capels Creek Canyon and the forbidding volcanic jungle of Hell's Delight, this relic of cosmic upheaval, shown in the adjoining column, is offered by its discoverer as one of the most unique specimens of rock formations ever found.

Climbing among the rocks of the high ridge that rises between Amador and Alpine counties, in making a turn around the nose of a cliff, I came upon his majesty, “Mephistopheles of the Mountains.” The demoniac ensemble is almost perfect. Note the leering profile, the sinister sneer, the horn on his head, the wart on his nose; all emphasized by the protruding beak, heavy eyelid and set jaw. Note too, the trueness to life in the relative size and proportion of facial features.

As if presiding with fiendish demeanor, here for unknown centuries, he has looked down into the rugged wilderness, through which the undaunted Kitt Carson blazed his trail into California. This Devil's head of black lava measures about seven feet from chin to crown. It can not be seen from the highway and can only be found by a strenuous climb and hike along the crest of the lava ridge to the east of Silver Lake. With the exception of retouching out a dark spot of background beyond the profile, the photo has not been altered.

FOREST FIREBUGS FLOGGED

That the forest incendiary is not a new menace to public welfare is proved by a law promulgated 250 years ago in Pennsylvania says a California Region, U. S. Forest Service report. In 1676 the Duke of York, brother of King Charles II of England, made the penalty for kindling a fire in the woods and permitting it to escape to cultivated land, the payment of all the damages plus one-half more as a fine. If the guilty person could not pay he was liable to receive “not exceeding 20 stripes,” or in other words, be publicly whipped.

“Do you want gas?” asked the dentist as he placed the patient in the chair.

“Yes,” said the absent-minded professor. “About five gallons—and take a look at the oil.”



HERE'S “MEPHISTOPHELES of the Mountains” leering down on Capels Creek Canyon.

Move to Stimulate Highway Employment

“As a stimulus to employment and to effect needed highway improvements as soon as possible, a Construction Congress has been proposed in which all branches of highway activities will be represented,” states T. H. Cutler, president of the American Road Builders Association.

“The Congress should lay the foundation for renewed activity in road and street building,” said Mr. Cutler. “A somewhat similar conference was held last fall at the call of President Hoover with a view to putting home building on a sound and active basis. Small home building is today one of the bright spots in the construction picture.

At the recent annual meeting of the American Road Builders' Association in Washington, D. C., a spirit of optimism for the future prevailed and the opinion was expressed that the time is ripe to launch a cooperative effort to develop construction.”

Seventeen thousand consolidated schools in the United States last year used 49,000 motor buses to transport pupils.

Roads of the Future Being Evolved By Perfecting Discoveries of Ancients

By THOS. E. STANTON, JR., Materials and Research Engineer

A recent newspaper editorial intimates that chemistry has done little, to date, for the building of roads, but that there are indications that new surfaces will be evolved through chemistry that will surpass anything yet produced. The prediction is made that in some common by-product will be found the improved material for the roads of tomorrow.

The basic materials used in building road surfaces today were known and used in building construction over 5000 years ago. They are found so abundantly and cheaply in nature that it is difficult to conceive of any manufactured material, or by-product, which would be available in sufficient quantities to compete economically or to keep up with the current demands for road surfacing materials.

From seventy-five to ninety-five per cent of a standard paving mixture consists of the rock, sand, and earth so generously provided by mother nature. Man's main problem is to find the best cement which can be economically used to bind these basic materials into a strong wear-resisting mass.

RAPID PROGRESS

Having developed a suitable binder, the next problem is one of determining the proper combination of this binder with the locally available aggregates which will result in a high quality and, at the same time, economical product.

Rapid strides have been made during recent years by engineers and chemists in improving the quality of these cement binders, and in the development and understanding of the basic principles governing the correct combination of the various ingredients to give the best results under any given set of conditions.

The solving of these problems, as applied to local materials, as well as the testing of all ingredients for quality, constitutes the principal work of state highway materials and research departments.

The cementing materials commonly used in road construction are the asphaltic and hydraulic cements.

ASPHALT CEMENTS

According to Herbert Abraham, the term "asphalt" may be traced back to Babylonian times. It was later adopted by the Greeks in the form of an adjective signifying "firm," "stable," "secure." The first use of asphalt by the ancients was in the nature of a cement for securing or joining together various objects.

The earliest recorded use of asphalt by the human race was by the pre-Babylonian inhabitants of the Euphrates Valley (about 3000 B. C.). These people, known as Sumerians, were skilled in carving and decorating stone, as evidenced by the varied and interesting specimens of pottery and statuary unearthed in recent years. In certain of these we find shells or bits of stone cemented in place by means of asphalt.

Of all the Babylonian rulers, Nebuchadnezzar, who reigned 604 to 561 B. C., was the most progressive, and is stated to have reconstructed the entire city. The bricks bore inscriptions relating to his work, and several specifically refer to the use of asphalt. One found in the so-called "Procession Street" which led from his palace to the north wall, reads as follows:

FIRST PAVEMENT B. C.

"Nebuchadnezzar, King of Babylon, he who made Esagla and Ezida glorious—Son of Nebopolassar, King of Babylon. The streets of Babylon, the Procession Street of Nabu and Marduk, my lords, which Nabopolassar, King of Babylon, the father who begot me, had made a road glistening with asphalt and burned brick; I, the wise suppliant who fears their lordships, placed above the bitumen and burned bricks a mighty superstructure of shining dust, made them strong within with bitumen and burnt bricks as a high-lying road. Nabu and Marduk, when you traverse these streets in joy, may benefits for me rest upon your lips, life for distant days, and well being for the body. Before you I will advance upon them, may I attain eternal age!"

This would seem to be the forerunner of the present day pavement composed of stone

(Continued on Page 20)



PORTLAND CEMENT CONCRETE pavement on Golden State Highway through Lodi in San Joaquin County.



ASPHALTIC CONCRETE pavement with traffic lines on the Coast Highway in Santa Clara County.



THE CALIFORNIA
type of oil mix
surfacing has
established its worth as
an economical and
durable type. It has
proven its value on long
stretches of mountain
and desert roads. This
scene is on the Placer-
ville-Tahoe route in El
Dorado County.

State Rich in Road Building Materials

(Continued from page 18)

blocks set in asphalt. According to Nebuchadnezzar, his father Nabopolassar (625-604 B. C.) is credited to have laid the first asphalt block pavement of which we have any record. It seems strange that the art should have become lost to mankind, only to be rediscovered in the nineteenth century A. D.

INCAS USED IT

It has been established that the Incas of Peru (sometime before A. D. 1500) constructed an elaborate system of highways, some of which were paved with a composition not unlike modern bituminous macadam.

Although undoubtedly used in a limited way in road and foot path construction throughout the centuries, the first large area of asphalt roadway was constructed in Paris in 1858, followed by a stretch in London in 1869, and in the United States for the first time in 1870.

Although there are a number of local natural asphalt deposits in California, the main source of supply of asphaltic road oils and asphaltic cements is from the crude petroleum with which California is so plentifully supplied.

The commercial crude oils of California are essentially of naphthenic or asphaltic base, with few exceptions.

It is from these crude oils that the road building oils and asphalts are derived after removing part or practically all of the volatile constituents.

The resultant asphaltic residue is a viscous product of a hardness depending on the method of treatment and the degree to which the volatile has been removed.

DECIDED BY TESTS

It is the duty of the Testing Engineer to test these products to ascertain if they comply with certain defined specifications and to then determine, by trial, the best combination of aggregate and asphaltic binder to give the most stable results when compacted into a finished pavement surface.

The asphalt must not be so hard or limited in amount as to cause the pavement to crack and disintegrate, nor must it be so soft or excessive in amount as to cause a rutting and waving under the action of traffic in the

heat of the sun. It must be determined that the aggregate to be used has a greater affinity for the oil than for water so that it is not readily affected by moisture from rains.

While tests of the separate ingredients have become well standardized, tests for the durability and stability of the combination thereof are still very much in the experimental stage. The California Materials and Research Department has been doing its share in the development of stability testing equipment and procedure.

Equipment for the purpose has been designed and built at the machine shop of the Laboratory, and numerous stability tests of good and bad examples of asphaltic pavement surfaces are being made in an effort to devise some means of predicting, in advance, the probable service value of designed pavement mixtures. Although much encouraging progress has been made, there is considerable work to be done before full success can be claimed.

PORTLAND CEMENT CONCRETE

Of equal, if not greater, importance to asphaltic cement as a binder, we have Portland cement, an intimately mixed, burned, and ground combination of lime and silica which has the property of setting up into a hard insoluble product in the presence of moisture.

Unlike asphaltic cement, Portland cement does not occur in nature, but must be specially manufactured for the purpose. To this extent, therefore, Portland cement is a triumph of the chemist, as there does not seem to be any evidence that truly hydraulic cements of the kinds we use now were ever employed by the older Asiatic, Egyptian, or East Mediterranean civilizations.

This class of cement, however, had its counterpart in the remote periods of antiquity, as there is more or less proof that at a very early stage of human progress, say ten thousand years ago, both lime mortars and gypsum plasters were put to use in Egypt and elsewhere.

GROUND CLINKER

Portland cement, now the most important of our cementing materials, was invented in

Chemical Research Perfecting Mixes

(Continued from preceding page)

1825. It is an artificial chemical product of fairly definite composition, containing approximately 60 to 65 per cent lime, 20 to 25 per cent silica, and 5 to 12 per cent iron oxide and alumina. In the manufacture of Portland cement, the various ingredients are first intimately mixed in the proper proportions, then the raw mix must be burned at a very high temperature until it unites chemically and physically as a clinkered mass, after which the clinker so formed is ground very finely. The end result of these processes is the Portland cement of commerce.

In determining the proper combination of the various ingredients, the chemist must make a complete chemical analysis of each. The chemical reactions which take place are complicated and, in many respects, very little understood.

The quality of the cement affects the strength and other qualities of the resultant concrete which is made by mixing the cement with fixed proportions of rock, sand, and water. Through the chemical reactions which take place during the process of hardening, considerable heat is evolved. The amount of heat thus evolved governs, to a certain extent, the rate of hardening and subsequent volumetric changes in the concrete mass as, under the heat of setting, there is an expansion of the concrete with a corresponding shrinkage as the temperature drops, thus causing the concrete mass to form shrinkage cracks, the extent and number of which are governed by the extent of the shrinkage and the strength of the concrete.

TASK FOR CHEMIST

In addition, there must be as complete hydration or hardening of the cement ingredient as possible, otherwise the resultant concrete will lack durability and will not resist the weathering action of the elements in the form of rain, frost, sea waters, and drainage waters with high percentages of alkali and other corrosive agents. This hydration takes place only in the presence of water and it is, therefore, necessary that all fresh concrete be kept moist as long as practicable.

As a further requirement for durability, the concrete must be as dense as possible so that unavoidable corrosive agents may not

penetrate below the surface, thereby promoting disintegration. The rock used must be hard and durable and must not swell or break down when wet, as this swelling or breaking down causes cracks to develop in the concrete mass with subsequent disintegration. The sand must be clean and hard so that the cement may form an intimate bond which will not be subsequently disrupted by pulling loose under tension or by a rupture of the sand particles.

The chemist and concrete technologist have their hands full in overcoming the difficulties outlined above. Constant study and experiment, however, is gradually bringing about a more complete understanding of the subject and the problems are gradually being solved with the result that the average quality of concrete products has been increasing each year.

NEW FORMULAS DEVELOPED

New cements are being developed which evolve less heat in setting and consequent lessened volumetric changes without material sacrifice in early strengths. Other cements are being manufactured which develop a high early strength without most of the objectionable features which, in the past, have been associated with this grade of material. Formulas have been worked out for the designed concrete mixtures which will result in the densest concrete obtainable with a given amount of cement, and methods of manufacturing and compacting concrete masses have been developed to the extent where it is possible to manufacture concrete which will develop strengths several times the average strengths of a few years ago without increase in the cement content.

The California Materials and Research Department has contributed its share to the increased knowledge of this subject, and a considerable part of the time of the laboratory force is spent in studying the materials and combination of materials furnished for each construction project to the end that the best possible results may be secured, thereby saving hundreds of thousands of dollars annually in the increased service and life accruing from high class concrete construction.

Fourteen Major Highway Projects on Schedule for Month's Advertising

/ / / / / /

COLONEL WATER E. GARRISON, Director of the Department of Public Works, during the month of July, planned to advertise fourteen major projects for construction on State highways at an estimated cost of \$3,300,000.

These projects included ten road jobs and four bridge jobs. The road projects cover work on approximately 88 miles of State highway, amounting to some \$2,850,000, and the four proposed bridge projects will involve the construction of seven bridges at an estimated cost of about \$450,000. The work is distributed well over the State and is located in twelve counties.

The following brief description of a few of the more important projects proposed for July advertising give a conception of portions of the work as it has been planned.

In Los Angeles County the construction of the Ridge Route Alternate is moving forward. The grading on the fourteen and one-half miles covering the southern half of this new mountain highway has been completed from Castaic School to Piru Creek and grading on the northerly half, from Piru Creek to Gorman, is progressing. It is now proposed to advertise a project for placing a thirty-foot Portland cement concrete pavement on the newly constructed roadbed on the southern 14.5 miles. Full details of the new routing of this important connection between southern California and the San Joaquin Valley are given in another article in this issue.

INCLUDES FOUR BRIDGES

As another unit in the construction of this new Ridge Route Alternate it is planned to call for bids during July for the construction of four steel girder bridges across Piru Creek to effect the necessary crossings of this stream in the Piru Gorge. The bridges will be four and five span structures of lengths varying from 280 to 340 feet.

The State highway which leads into the Sequoia National Park from Visalia is to be constructed on new location from Lemon Cove, 19 miles east of Visalia, to the town of Three Rivers. This relocation covers some

8.5 miles of State road in Tulare County and will eliminate a section of sharp curves and broken grades. The total curvature on the existing route is 3798 degrees while the curvature on the new location amounts to only 534 degrees.

ALONG KAWEAH RIVER

There will be a saving of about 1.1 miles in distance by the relocation, as the highway will be constructed along the Kaweah River from a point about two miles easterly of Lemon Cove to the end of the project. The new construction will consist of a 24-foot roadbed with a bituminous treated surfacing 20 feet wide.

Two years ago the 12-mile section of the Ukiah-Tahoe lateral leading eastward from Nevada City was graded. It is now proposed to reinforce the grade where settlement has taken place and surface the entire distance from Nevada City to one mile west of Washington Road with a bituminous surface treatment. This lateral, which connects the Auburn Truckee route across the Sierra Nevada at Emigrant Gap with the Redwood Highway at Ukiah, is rapidly being improved to modern standards.

SURFACING FOR LATERAL

It is also planned to advertise for bids during the coming month for the placing of a similar surface on the roadbed which was graded a year ago on the section of this route from Abbott Mine in Lake County to a point five miles west of Williams in Colusa County. This section of the Ukiah-Tahoe highway leads from the mountains of Lake County down to the floor of the Sacramento Valley.

An important improvement to the heavily traveled Sacramento-Los Angeles artery will be put under way this month with the advertising for the construction of a 1250-foot steel and concrete girder bridge across the Merced River near Livingston in Merced County. This new structure will replace the old 1390-foot steel truss and stringer bridge with its narrow roadway which was built in 1913 by the county.

Work Offered to Bidders in July

The following improvements with an estimated total cost of approximately \$3,300,000 were planned to be advertised for bids prior to August 1. The proposed work includes 14 major road projects totaling 88 miles of State highway, and seven bridges in 12 counties as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type of Surface
Los Angeles	Brea Canyon Road to Pomona	6.2	Port. Cem. Con. Pave.
Alameda	Castro Hill to Stanton Avenue	2.4	Port. Cem. Con. Pave.
Los Angeles	Castaic to Piru Gorge	14.4	Port. Cem. Con. Pave.
Imperial	Sand Hills to Araz Junction	7.9	Asphalt Con. Pave.
Shasta	Canyon Creek to Hat Creek Summit	10.2	Bit. Treat. Crush. Rock
Tulare	Lemon Cove to Three Rivers	8.5	Bit. Treat. Crush. Rock
San Bernardino	Camp Waterman to Arrowhead Spgs.	4.5	Bit. Treat. Crush. Rock
Lake and Colusa	Abbott Mine to 5 Mi. W. of Williams	18.9	Bit. Surf. Treat.
Nevada	Nevada City to Washington Road	11.7	Untreated Crush. Rock and Armor Coat.
Monterey	San Remo Divide to Carmel River	3.7	Graded Roadbed
San Joaquin	Across Paradise Cut	----	Steel Stringer Bridge
Merced	Across Merced River near Livingston	----	Steel and Conc. Br.
San Joaquin- Stanislaus	Across Stanislaus River	----	Conc. and Steel Br.
Los Angeles	Across Piru Creek	----	4 Reinf. Conc. Gir. Br.

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement-----	23.0	\$1,012,700
Asphalt Concrete Pavement-----	7.9	418,400
Bituminous Treated Crushed Rock Surfacing-----	42.1	1,193,900
Untreated Crushed Rock Surfacing-----	11.7	41,000
Graded Roadbed -----	3.7	176,000
Bridges -----	(7)	477,400
Totals -----	88.4	\$3,320,000

New State Building in Los Angeles

Dedicated With Impressive Ceremony

WITH massed bands, totaling 1000 musicians playing and 100 airplanes from March Field circling over the heads of thousands of cheering citizens and distinguished guests, including 2 governors of other States, Governor James Rolph, Jr., dedicated the new State Building in Los Angeles with impressive eloquence and ceremony on July 29th.

Taking place on the day preceding the 10th World Olympiad, the event was made more spectacular and colorful by the gala la fiesta spirit prevailing in the southern metropolis and reflected in all the arrangements made by Chairman John G. Mott and his citizens committee representing the 13 southern counties, assisted by Deputy Director of Public Works James I. Herz and State Architect George B. McDougall.

SURROUNDED BY FLAGS

The speakers' stand, accommodating 150 distinguished guests, occupied the center of the Spring Street front of the building facing the city hall and the open areas of the Civic Center. In front of the stand a roped-off area of Spring Street provided space for 1500 invited guests. The massed bands of 1000 instruments occupied the high ground just to the rear of the speakers' stand while 400 flag bearers were grouped behind and around the platform, surrounding it on three sides with myriad waving colors.

The east front of the towering structure was gaily decorated with banners and bunting and massed in front of it was a great throng, filling the space provided for the accommodation of 50,000 people by the closing off of Main Street from First to Broadway and Spring Street from a point between Second and First streets to about Temple Street.

100 PLANES MANOEUVRE

The dedication was preceded by a public luncheon at the Biltmore Hotel under the auspices of the Los Angeles Chamber of Commerce and the Los Angeles Rotary Club, at which Hon. Charles Curtis, Vice President of the United States, and Governor James Rolph, Jr., were the guests of honor. The governors of 2 other States and representa-

tives of 13 southern counties were among the distinguished guests.

On arrival at the State Building the Vice President was accorded a salute of 19 guns by the 160th Infantry, "Los Angeles' Own."

The dedication ceremonies began at 2 o'clock with an exhibition of aerial manoeuvres by the 100 planes from March Field, under command of Col. Henry H. Arnold. The dedication program, beginning at 3.30 p.m., was as follows:

America.....	Massed bands (1000 pieces) —Massed Colors
Invocation.....	Rt. Rev. W. Bertrand Stephens
Address of Welcome.....	Hon. John G. Mott General Chairman
Remarks.....	Hon. John C. Porter Mayor of Los Angeles
Introduction of distinguished guests.	
Presentation Distinguished Flying Cross to Amelia Earhart Putnam by the Hon. Charles Curtis, Vice President of the United States.	
Remarks.....	His Excellency Governor Balzar of Nevada
Remarks.....	Hon. Wm. M. Garland Chairman Olympic Games
Remarks.....	Rabbi Edgar Magnin
Remarks.....	Colonel Walter E. Garrison Director of Public Works
Remarks.....	Rolland A Vandegrift Director of Finance
Dedicatory Address.....	
..... His Excellency James Rolph, Jr. Governor of California	
Benediction.....	Rt. Rev. John Cawley
Massed Band of 1000—Massed Colors	

\$2,000,000 INVESTMENT

The State Building represents an investment of upwards of \$2,000,000 and is the culmination of many years of effort on the part of the people of southern California to secure an adequate and suitable building in which to house various State department offices in the southern city. There are 25 departmental divisions, bureaus and commissions accommodated in the building.

In addition to these, the building provides accommodations for the Supreme, Appellate and Superior courts, quarters for the Governor and Lieutenant Governor and a large assembly hall.

The building is 13 stories high, monumental in design, of Class A construction,



AN IMPOSING STRUCTURE is the thirteen-story Class A State Building in Los Angeles, formally dedicated by Governor James Rolph, Jr., on July 29 with impressive ceremony, in the presence of a great throng of citizens and distinguished guests, including eleven governors from other States. The occasion was marked by the flight of 200 planes in aerial manoeuvres over the scene while massed bands aggregating 1000 instruments played inspiring music between addresses by notables and officials.

built of reinforced concrete, structural steel, granite and terra cotta. The architects were John C. Austin and Frederick M. Ashley of Los Angeles. It was erected under the direction of Colonel Walter E. Garrison, Director of the Department of Public Works and State Architect George B. McDougall.

SAVES \$85,000 RENTALS

The imperative need for the building grows out of the fact that the State has been paying rentals for very inefficient office space in Los Angeles of approximately \$85,000 annually. The building will just about supply the present needs for floor space.

It is significant that approximately all of the material for the building except the

structural steel was obtained in California and the fabrication of the structural steel was done in the city of Los Angeles.

The history of the new building dates back to the Legislature of 1925 which passed an act later ratified by the people at a general election in November, 1926, authorizing a bond issue including \$1,250,000 for the construction and equipment of a State Office Building in the city of Los Angeles. Subsequently an additional sum of \$607,350 was appropriated by the 1931 Legislature to construct two additional wings made necessary by insistent demands for additional space.

This property was deeded to the State free of cost by the county of Los Angeles and will be a part of the new Civic Center.

Vast Excavation Program Involved

(Continued from page 16)

Elimination of 1180 feet adverse grade, all sharp curvature, stretches of grade exceeding six per cent maximum and excessive superelevation by substitution of the high standards to be secured on the new location is expected to reduce operating expense on the other 26.85 miles at least 1 cent per mile as an average for all vehicles. This will amount to an annual saving in operation of \$392,000.

By providing on the new highway high standards of alignment and grade, from an analysis of recorded prevailing speeds, the average speed should be advanced 50 per cent on all classes of vehicles except the heaviest trucks. Light vehicles will cut an average of three-fourths hour from average time over present routing which will be equivalent to 985,500 hours annually.

TIME SAVINGS HIGH

This element of time can not be valued accurately, but is certainly a decided advantage particularly to business men. To commercial vehicles this time element is given an approximate monetary value. Assuming one-third hour saved for each truck and with driver's salary and rental value of \$3 per hour, there is an annual saving of \$110,000.

Other savings of the new location such as safety, comfort and decreased maintenance of roadway have not been evaluated.

Summing up tangible values we have:

Due to distance reduction-----	\$867,000
Due to lower operating cost on shorter route-----	392,000
Due to time factor on commercial vehicles-----	110,000

Total ANNUAL saving over next 10 years ----- \$1,369,000

The cost of the new route is estimated to be approximately \$2,900,000.

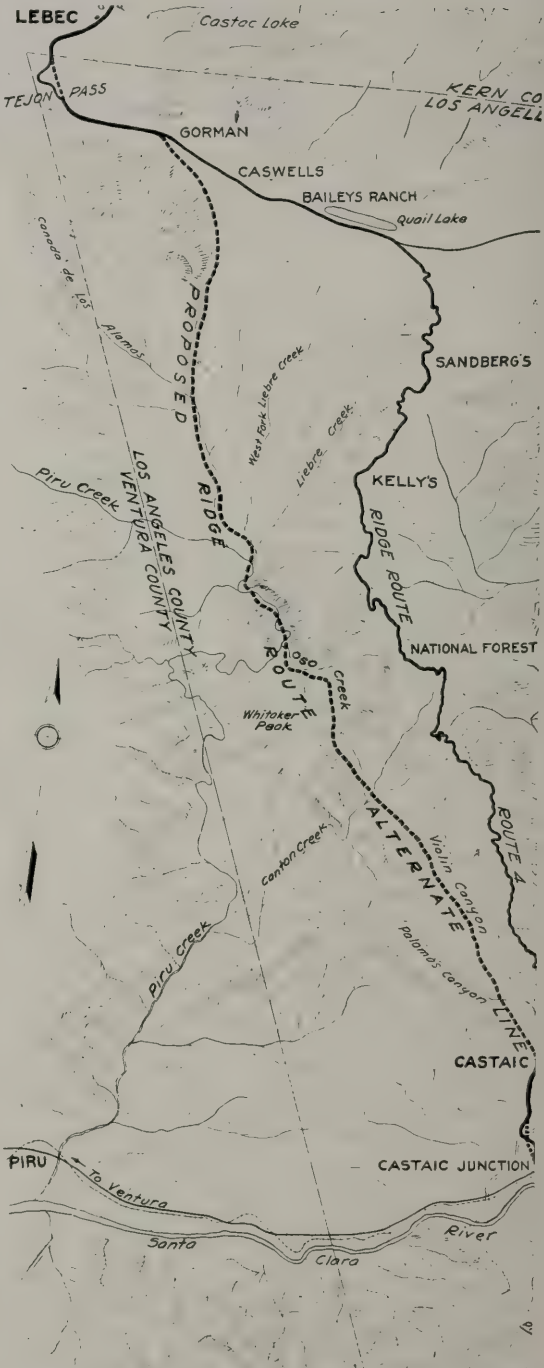
The annual saving capitalized at 5 per cent equals \$27,380,000, which is roughly 9½ times the cost of the new route.

Surveys and plans progressed to a point where the first grading contract on the southerly end of the project was awarded in February, 1930. This covered the grading and drainage structures from Castaic School to Canton Creek, a distance of 7.1 miles. The second grading contract, from Canton Creek to Piru Gorge, a distance of 7.32 miles, was awarded in April, 1931, and the final 12.5-mile grading contract from Piru Gorge to a point on the present Ridge Route near Gorman, was awarded in July, 1931.

VAST EXCAVATION

These three contracts involved the excavation of 3,712,000 cubic yards of earth and rock. On this vast excavation program there have been as many as 10 power shovels working at a time, three shifts per day. A fleet of trucks is required to haul this material to its final location in the highway embankment.

Numerous difficulties have been met and overcome. Channels of some of the creeks have been changed, the creeks being diverted around the highway embankments in concrete lined channels. A great many cul-



MAP SHOWING more direct line of proposed Ridge Route Alternate as compared with present route between Castaic and Gorman.

Ridge Alternate to Open for Traffic by End of This Year

(Continued from preceding page)

verts, slope drains and other structures are being provided to protect the embankments from erosion.

In keeping with modern highway construction practice, embankments are being placed in thin layers, each layer being wet and rolled before the succeeding layer is spread. This results in thoroughly compacted embankments on which pavement can be placed immediately, without waiting for them to settle.

The first grading contract was completed in August, 1931. The other two grading contracts should be completed by next September.

SEVEN BRIDGES

These grading contracts have not included the larger bridges on the route. There are seven of these to be built. A contract has recently been let for constructing three of them—one across Gorman Creek and two across Alamo Creek. It is planned to let a contract in the near future for the remaining four bridges across Piru Creek.

It is impossible to say at this time when the last paving contract will be let or when it will be completed. From present indications it seems probable that the entire Alternate Ridge Route will be paved and opened to traffic in the latter part of 1933.

This improvement, combined with an improved location from Gorman to the Kern County line for which plans are in progress, the new alignment which will eliminate Grapevine Grade in Kern County and the Weldon Canyon cutoff which has already been completed, will form a continuous high speed highway from Los Angeles to the San Joaquin Valley. Perhaps by the end of 1933 or possibly a little later one can drive from Los Angeles to Bakersfield in 2½ hours without exceeding the speed limit.

COMPARATIVE COSTS

Some may wonder why, with such a location as the Ridge Route Alternate possible, it was not built originally in place of the tortuous alignment of the old Ridge Route. The answer is simple when one takes into consideration the limited funds available in 1912 and the improvement in highway construction equipment since that date. The average cost per cubic yard for excavation on the old route was 42 cents; that on the new route 30 cents. There were but 1,023,000 cubic yards of excavation on the old route; on the new there are 3,712,000 cubic yards. The unit cost of overhaul of excavated material in constructing the old route was nearly three times the contracted unit prices on the new. The old route required 393,000 station yards of overhaul; the new route will require 24,324,000 station yards or 62 times more.

The cost of grading and structures alone on a road similar to the Ridge Route Alternate at the contract price paid for the original Ridge Route would be \$2,549,000 or nearly five times what this work cost on the original route. It would have cost a sum equal to nearly 1/7 of the original State highway bond issue which had to be apportioned over the entire State at that time. It is little wonder then that a road was built which came within the funds available and which could serve the public for so many years.

State Aids Fresno in Building Traffic Circle Improvement

(Continued from page 2)

right turns only. No great additional length of travel is necessary for any combination of movements. The traffic is thus required to "weave" across to the intersection desired rather than to concentrate at a direct intersection of traffic flow.

The Kern County Planning Commission had previously acquired valuable data from the East and had proposed the traffic circle as a solution of one of their problems in Bakersfield. Their plan therefor antedates the one at Fresno but this one is the first to be constructed in California.

PROVIDES PARK ENTRANCE

The land occupied by the circle was largely public park and road space, and the improvement provides a more attractive and less dangerous entrance to the park.

Detail work on plans and actual supervision of the construction were under supervision of the city of Fresno, in cooperation with the Southern Pacific Railroad Company. Plans and specifications were approved by the State. Two contracts were required for the project, the traffic circle and connection pavements being awarded to a Fresno company for \$30,929.50 and the subway contract awarded to another Fresno company for \$57,057.25. Additional work not included in the above contracts is the superstructure and placing of tracks by the railroad company, the landscaping and ornamentation of the traffic circle and the right of way costs.

COST OVER \$200,000

The State provided \$70,000 for the improvement; Fresno County \$30,000; the Southern Pacific Railroad Company between \$70,000 and \$80,000 and the city of Fresno the balance, which will probably be about \$40,000.

A plaque will be placed in the traffic circle acknowledging the cooperation of the State.

A formal celebration marking the opening of the improvement was participated in by officials of Fresno City and County, the State, Southern Pacific Railroad Company, civic organizations and the general public.

"I see you're letting your little son drive the car."

"Yes, he's still too young to be trusted as a pedestrian."—*Mouthpiece.*

Narrow Road Took Toll of Accidents

Continued from page 13)

a section 150 feet in length, containing 10,250 cubic yards of solid rock. The height of the formation prohibited the use of down holes with economy, and the use of the coyote method was frowned upon because of the possibility of heavy overbreak.

However, after considerable deliberation and study on the part of the department's engineers and representatives of powder companies, the latter method was chosen as it was desirable to waste as much of the material as possible due to a surplus in the vicinity. Two parallel tunnels were drilled along the gutter lines of the road, three small pockets being

All construction materials were hauled to the work by motor truck from Redding over 60 miles of highway. The improvement of the road between Redding and Weaverville, a distance of 50 miles, was a big factor in cutting transportation costs and increasing speed of delivery. The location of this work was a few years ago a five-hour trip from Redding by automobile, while at the present time it may be covered in two hours by experienced drivers.

The location of the camp for a convict project was ideal. Situated on the Trinity River on a small, wooded flat, inaccessible to



provided in the outer one and five in the inner. Loads were placed in proportion to the volume of rock to be dislodged, nearly six tons of powder being used.

BIG SHOT SUCCESSFUL

The charges were detonated simultaneously with electricity. Approximately two-thirds of the cut was laid clear of the roadway, falling into the Trinity River. Considerably less than the usual amount of overbreak developed, and it is probable, because of the structure of the formation, that any other method would have developed as much.

The work is being prosecuted with a force consisting of 50 convicts and about 12 free men. These forces are also used in the clearing of right of way, construction of drainage structures and other activities which go into the building of a highway. A one-yard Os-good gasoline powered shovel is being used.

motor vehicles, it was necessary first to build a road over which to transport the camp construction materials and equipment. The convicts were removed from contact of any kind with the traveling public, which was unaware until the opening of the new unit, of the existence of such a camp, or even of the construction project, as it was removed from the existing traveled road except at the extreme ends.

An interesting feature of the alignment is the absence of sharp curvature. The minimum radius of curvature is 525 feet and the maximum, 5000 feet. The lineal footage of curvature is exactly one-half of the total length of the project or 2.37 miles. The tabulation below indicates several of the features of the work commented on in the text. It will be noted that the curvature is remarkably easy for mountainous location. Following tabulation gives complete figures:

Mountain "Hydraulicked" Into Stream

(Continued from preceding page)

Radius	Radius	Radius
525' to 850'	1000' to 1800'	3000' to 5000'
9 curves	14 curves	2 curves
370° total delta	299° total delta	24° total delta
4106 feet	6882 feet	1513 feet
Total length of job-----	4.76 miles	
Total length of old road-----	5.06 miles	

HAZARD REMOVED

The opening of this project to traffic hinged upon the completion of the Canon Creek bridge at Junction City which was let under contract by the Bridge Department. Prior to the completion of the structure, a ford in the creek was used by our own forces, but this was not open to public travel. However, upon completion of the bridge on June 25, the section between Junction City and Valdor, which had already been processed with fuel oil as a dust palliative, was turned over to traffic and the necessity of using the old hazard removed.

The scenic attractions on this unit are not of the usual character found in mountainous localities. While the country is rough and rugged, vegetation is not thick or vigorous and does not attract the eye as in the heavily forested areas.

The principal points of interest are the traces left on the face of Mother Nature by the placer mining operations of former years. Great scars and gashes cleave the mountain sides where the gravelly earth has been torn out by the terrific force of hydraulic giants and washed away through sluiceways ingen-

iously devised to trap the precious gold particles hidden there.

The broad cobbly bed of the Trinity River with its widening low water channel is composed of the gravelly waste resulting from these operations and extends along its canyon and tributaries for miles in depths as great as 100 feet. The easterly end of the project is at Oregon Gulch, near the great La Grange mine, one of the largest placers in the world, where a whole mountain was torn away, and discharged into the channel of the gulch.

PARADISE FOR HUNTERS

Fortunes were made in this locality and fortunes lost in the delvings for the precious metal, and in all probability there are fortunes yet remaining, if one but knew where to search.

Route 20 provides access from the Sacramento Valley and from the coast to a veritable paradise for hunters and fishermen. During the hunting season a heavy increase in traffic is noticeable, and during this period one daily sees successful exponents of the rod and gun returning homeward with their trophies. Trinity County provides vacation areas favored by many, and improved highways are gradually making these more easily accessible as well as providing a quick outlet to the coast from the hot interior for week-end vacationists.

Plans to Celebrate Birthday of Nobel

The Institute of Makers of Explosives, New York City, will observe in 1933 the centennial of the birth of Alfred Bernhard Nobel, "the father of high explosives."

The institute points out that "Nobel's discovery of dynamite was one of the greatest boons to the advancement of civilization the world has known since the printing press was invented." He was born in Sweden, October 21, 1833; educated in America and Russia.

The first successfully to manufacture and use nitroglycerine as a blasting agent, he also invented blasting-gelatine, gelatine-dynamite, and a smokeless powder.

Guide—"This is a skyscraper."

Sweet Young Thing—"Oh, my—I'd love to see it work."—*San Joaquin Power Magazine.*

PINES-PALMS HIGHWAY OPENED WITH CELEBRATION

Opening of the Pines-to-Palms Highway in Riverside County, a cooperative project between Riverside County and the U. S. Forest Service, was celebrated at Keen Camp at San Jacinto Mountain, June 18.

This road, graded to modern standards, leads from the 4800-foot elevation of pine-clad San Jacinto Mountain nearly to sea level of Coachella Valley and the Palm Springs area. It offers a direct route for residents of Coachella and Imperial Valley into the cool recreation land of the San Jacinto Mountains.

The celebration featured a mid-day barbecue, speeches by several prominent road enthusiasts, music and appropriate entertainment, with dancing during the evening.

He (awkward dancer)—"It was nice of you to give me this dance."

She (sweetly)—"Not at all—this is a charity ball."

Highway Bids and Awards for June

AMADOR COUNTY—Between Amador City and Martell, about 4.8 miles to be surfaced with bituminous treated crushed gravel. Dist. X, Rt. 65, Sec. B. Hemstreet & Bell, Marysville, \$15,326; Tiffany, McReynolds & Tiffany, San Jose, \$14,753; Pereira & Reed, Tracy, \$15,073; A. Teichert & Son, Inc., Sacramento, \$14,058; C. W. Wood, Stockton, \$13,945; Granite Construction, Watsonville, \$16,198. Contract awarded to Willard & Biasotti, Stockton, \$12,609.

CONTRA COSTA COUNTY—Dist. IV, Route 14—Between San Pablo Creek and Carquinez Bridge, about 10.6 miles to be graded and paved with P. C. C. and A. C. Kern & Kibbe, Portland, Ore., \$374,669.25; Clark & Henery Construction Co., San Francisco, \$396,545.30; Clyde W. Wood, Stockton, \$371,500.35; Peninsula Paving Co. and J. P. Holl and Inc., San Francisco, \$334,773.45; Fredrickson & Watson Construction Co., Fredrickson Bros.-Jones and King, Oakland, \$351,596.40; Union Paving Co., San Francisco, \$333,526.85; Hanrahan Co., San Francisco, \$324,333.10; D. McDonald, N. M. Ball and A. Teichert & Son, Inc., \$384,682.35. Contract awarded to Basich Brothers Co., Torrance, \$322,793.10.

DEL NORTE COUNTY—Dist. I, Route 1—Between Crescent City and Madrona Camp, 6.9 mi. to be surfaced with bituminous treated crushed gravel or stone. Pacific States Construction Co., San Francisco, \$62,433.85; A. Teichert & Son, Inc., Sacramento, \$63,807; Hemstreet & Bell, Marysville, \$59,906.95. Contract awarded to Mercer-Frazier Co., Eureka, \$58,028.25.

KERN COUNTY—Dist. VI, Route 57—Between Democrat Springs and Weldon, about 30.6 miles of dust oiling. Hartman Construction Co., Bakersfield, \$12,690; Oilfields Trucking Co., Taft, \$10,871.10; Fred W. Nighbert, Bakersfield, \$10,998. Contract awarded to Western Motor Transfer, Inc., Santa Barbara, \$10,321.20.

MONTEREY COUNTY—Dist. V, Route 56—Monterey County, between city limits of Carmel and Carmel River Bridge, about 1.9 miles, portions to be treated with fuel oil and seal coats to be applied over entire length. Contract awarded to Granite Construction Co., Watsonville, \$2,801.55.

MONTEREY COUNTY—Dist. V, Route 2—Monterey County between 2 miles and 9 miles north of Salinas, 5.5 miles to be treated with heavy fuel oil on each side of pavement and 1.4 miles finishing shoulders. Granite Construction Co., Ltd., Watsonville, \$6,412.95; Stewart & Nuss, Inc., Fresno, \$6,213.35; Lee J. Immel, Berkeley, \$6,121.40; Peninsula Paving Co., San Francisco, \$7,165. Contract awarded to Santa Maria Construction Co., Santa Maria, \$6,002.60.

SAN BERNARDINO COUNTY—Between Halloran Summit and Mountain Pass, 16.5 miles to be graded and surfaced with oil treated crushed gravel or stone. Dist. VIII, Route 31, Sec. MN. Fred W. Nighbert, Bakersfield, \$230,522; Dodge Bros., Inc., and A. Teichert & Son, Sacramento, \$227,648; Peninsula Paving Co., and J. P. Holland, San Francisco, \$231,412; Gibbons and Reed, Burbank, \$246,980; Sander Pearson, Santa Monica, \$246,890; Griffith Company, Los Angeles, \$230,252; Isbell Construction Co., Carson City, Nevada, \$279,954; V. R. Dennis Const. Co., San Diego, \$231,439; R. E. Hazard Const. Co., San Diego, \$219,746. Contract awarded to Basich Brothers, Torrance, \$218,690.

SAN BERNARDINO AND RIVERSIDE COUNTIES—Dist. VIII, Routes 26, 59, 43—Between Corona and Orange County line; between Santa Ana River Bridge and Ontario; between junction routes 31 and 59 and L. A. County line, 45.6 miles shoulders and roadbed to be treated with oil. R. E. Hazard Contracting Co., San Diego, \$41,538.40; F. W. Teschke, Hollywood, \$40,113.60; Martin Bros. Trucking Co., Long Beach, \$42,524.80; Kemper Construction Co., Ltd., Los Angeles, \$39,017.60; Miracle Co., San Diego, \$41,867.20. Contract awarded to Southwest Paving Co., Los Angeles, \$38,140.80.

SAN LUIS OBISPO COUNTY—Dist. VI, Route 56—Two steel stringer bridges, about 6 miles south of San Simeon. R. R. Bishop, Long Beach, \$71,103.15; Carl N. Swenson Co., San Jose, \$66,207.80; M. A. Jenkins & J. W. Hoopes, Sacramento, \$66,940.80; Barrett & Hilb, San Francisco, \$74,342.50; Rocca & Caletti, San Rafael, \$77,033.30; Fredrickson & Watson Construction Co. and Fredrickson Bros., Oakland, \$67,855.95; Lord & Bishop, Sacramento, \$70,027.90; Geo. J. Ulrich

Construction Co., Modesto, \$71,994.20; M. B. McGowan, Inc., San Francisco, \$67,459.82; Smith Bros. Co., Eureka, \$74,077.15; Hartman Construction Co., Bakersfield, \$69,005.20; Dodge Bros., Inc., Fallon, Nevada, \$76,847; Oberg Bros., Los Angeles, \$77,781.69; M. J. Bevanda, Stockton, \$66,261.90; Byerts & Dunn, Los Angeles, \$97,233.50; Gist & Bell, Arcadia, \$67,720. Contract awarded to J. W. Terrell, Sacramento, \$63,223.80.

SAN LUIS OBISPO COUNTY—Dist. V, Route 56—Between Cambria and 1 mile north of San Simeon, about 9.7 miles to be graded and paved with bituminous treated crushed gravel or stone. Western Motor Transfer, Inc., Santa Barbara, \$208,681.28; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, \$170,893.40; M. J. Bevanda, Stockton, \$177,912.65; Hemstreet & Bell, Marysville, \$162,117.55; Eaton Smith, San Francisco, \$205,301.90; Hartman Construction Co., Bakersfield, \$177,179.70; A. Teichert & Son, Inc., Sacramento, \$153,225.30; Clyde W. Wood, Stockton, \$173,005.50; Peninsula Paving Co. and J. P. Holland, Inc., San Francisco, \$164,723.30; Hanrahan Co., San Francisco, \$158,619.90; C. T. Malcom & Tieslau Bros., Walnut Creek, \$201,396.75. Contract awarded to Granite Construction Co., Ltd., Watsonville, \$144,687.30.

SANTA CLARA COUNTY—Dist. IV, Route 2—Between Gilroy and the Pajara River, rock borders to be bituminous surface treated and earth shoulders to be treated with fuel oil as a dust palliative. Lee J. Immel, Berkeley, \$3,925; Granite Construction Co., Watsonville, \$4,190; Tiffany, McReynolds, Tiffany, San Jose, \$4,562.50. Contract awarded to Pacific Truck Service, Inc., San Jose, \$2,958.

SISKIYOU COUNTY—Dist. II, Rt. 3—At Cottonwood Creek, about 0.8 mile to be graded and surfaced with bituminous treated crushed gravel or stone. J. P. Brennan, Redding, \$21,900.05; A. Young, Yreka, \$22,965.38; Dunn & Baker, Klamath Falls, Oregon, \$18,807.35; Milton A. Purdy, San Francisco, \$25,624.50; Tiffany, McReynolds, Tiffany, San Jose, \$16,533.93; Hemstreet & Bell, Marysville, \$18,229.88. Contract awarded to Skeels & Graham Co., Inc., Roseville, \$15,984.04.

VENTURA COUNTY—Dist. VII, Route 60—Between Calleguas Creek and the L. A.-Ventura County line, about 10.1 miles shoulders to be treated with fuel oil. Western Motor Transfer, Inc., Santa Barbara, \$5,232.60; Consumers Oil Co., San Gabriel, \$5,265; E. P. Ferry, Glendale, \$7,263. Contract awarded to Oilfields Trucking Co., Taft, \$5,211.

YOLO COUNTY—Dist. X, Route 6—Between Swingle and Yolo Causeway, about 1.7 miles to be graded and paved with P. C. C. Hanrahan Company, San Francisco, \$60,111.30; Clyde W. Wood, Stockton, \$58,728.30; Bundesen and Lavritzen and Delta Dredging Co., Pittsburg, \$60,260.10. Contract awarded to D. McDonald, Sacramento, \$55,481.55.

JUNE ARCHITECTURAL AWARDS

Pomona Armory—California National Guard, contract for general work to Louis A. Geisler, Huntington Park, \$19,616; for electrical to H. H. Walker, Inc., Los Angeles, \$1,073; for plumbing and heating to Toner & Brooks, Pomona, \$2,235.

Highway Patrol Station at Merced—Contract for complete work to Oliver S. Almlie, San Francisco, \$5,940.

California School for the Deaf, Berkeley—Contract for improvement to playgrounds to Ariss Knapp Company, Oakland, \$8,600.

Mendocino State Hospital—Fire house, contract to E. T. Leiter & Sons, Oakland, \$10,837.

Stockton State Hospital—Installation refrigeration work in Kitchen and Bakery Building to Oakland Refrigeration and Butcher Supply Company, \$9,447.

The Department of Agriculture estimates farm population at 27,430,000 on January 1, against 27,222,000 in the year previous, the first increase recorded since 1922.

WATER RESOURCES

*Official Report
as Of
July 1, 1932*

EDWARD HYATT, State Engineer

The development and achievements of the irrigation districts of California in the forty-five years since the passage of the act authorizing their organization with details of their operations in 1931, are given in the following report of State Engineer Edward S. Hyatt covering the activities of the Division of Water Resources for the month of June. Approval of plans for the construction of the huge San Gabriel Dam No. 1 by the Los Angeles County Flood Control District is announced. Other matters affecting dams, flood control and water distribution projects, snow surveys and stream flows are detailed in the report which follows:

Bulletin 21-C, a report on California irrigation districts for 1931, has been completed. This is the fourth bulletin of this character issued by the State since 1928, bringing up to January 1, 1932, authentic historical, financial and statistical data on California irrigation districts, and recording such other information of interest as was obtained on irrigation district activities in 1931.

It is noted that in the 45 years since the passage of the Wright Irrigation Act, 167 irrigation districts have been formed in California, 50 of which have been dissolved through legal proceedings. Two districts, the Crescent in Kings County and the Tia Juana River in San Diego County, were dissolved in 1931. There are approximately 4,000,000 acres in the 117 districts still retaining their organizations. Twenty-five of these are inactive, in that they have constructed no works and furnish no water to the included lands. One district, the Empire West Side, Kings County, was organized in 1931.

MAJOR RESERVOIRS

There are 24 major reservoirs, with a combined capacity of 1,413,000 acre-feet, in use by irrigation districts. Water stored for the season of 1931 amounted to 287,500 acre-feet, or about 20 per cent of the total capacity of the reservoirs. Diversions reported were 4,631,204 acre-feet by gravity, 765,560 acre-feet pumped from streams and 297,236 acre-feet pumped from wells. The total is 5,694,000 acre-feet, or about 80 per cent of the amount diverted in 1930.

The districts operated 295 irrigation wells and 252 drainage wells, and for all pumping operations reported an installation of 41,766 horsepower. To supplement the water supply furnished by the irrigation districts, landowners were reported as operating 12,519 irrigation wells. Twenty-one thousand acres more than for the previous year were reported irri-

gated. The districts contain a total estimated population of 324,500.

DISTRICTS VISITED

In connection with feasibility reports, conferences on district affairs and obtaining information necessary to the State Engineer's office, the following districts were visited: West Stanislaus irrigation district, Stanislaus County; La Canada and Palmdale irrigation districts, Los Angeles County; proposed Elsinore and Ladera irrigation districts, Riverside County; Fallbrook, Vista, Ramona, Lakeside, La Mesa, San Ysidro, Santa Fe and San Dieguito irrigation districts, San Diego County; Carpenter, Serrano, Newport Heights and Newport Mesa irrigation districts, Orange County; Buena Vista water storage district, Kern County.

DAMS

To date 810 applications have been received for approval of dams built prior to August 14, 1929; 94 for approval of plans for construction or enlargement and 269 for approval of plans for repairs or alterations.

Applications Received for Approval of Plans for Repair or Alteration.

Dam	Owner	County
Lower Stuarts Fork	La Grange Placers	Trinity
Pope	Lizzie Pope	Modoc
Lake of the Woods	Mr. and Mrs. J. D. Cuddy	Kern
San Carlos	Rancho San Carlos, Inc.	Monterey
Reflection Lake	Cal. Pac. Title & Trust Co.	San Mateo
Forest Lake	Monterey County Water Works	Monterey
Duke Res. No. 2	Royal E. Williams	Modoc
L. Wohlford	Escondido Mutual Water Company	San Diego

Plans for construction were approved for the San Gabriel No. 1 Dam to be built by the Los Angeles County Flood Control District. This is to be a huge rockfill structure 300 feet in height from streambed to spillway crest and having a storage capacity of 68,000 acre-feet at a cost of \$10,000,000. It will be situated in the San Gabriel Canyon about 6 miles northeast of Azusa in Los Angeles County and will be used for flood control and water conservation purposes.

Plans for Repairs or Alterations Approved.

Dam	Owner	County
Puddingstone	L. A. Co. Flood Control District	Los Angeles
McBrien River	McBrien Est. & Mrs. E. G. McConnell	Modoc
Feather River, Lower	Feather River Improvement Co.	Plumas
Lower Stuarts Fork	La Grange Placers, Ltd.	Trinity
Lake of the Woods	Mr. & Mrs. J. D. Cuddy	Kern
San Carlos	Rancho San Carlos, Inc.	Monterey
Cuyamaca	La Mesa, Lemon Grove and Spring Valley Irrigation District	San Diego
South Lambert	The Irvine Company	Orange

Mining Operations Using More Water

(Continued from page 31)

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The equipment and material assembled at Sutter headquarters is being cleaned, repaired, inventoried and stored. Hand tools are being sharpened and conditioned, for which purpose a power grindstone and emery wheels have been installed. In the warehouse yard the runways are being graveled.

The equipment of four small pumping plants has been installed and the irrigation of the willow planting along the east levee of the Sutter By-pass has been commenced. Also, additional willows are being planted along the west side of the borrow pit.

Repairs to bridges and timber structures in the by-pass have been continued, fire guards have been cut, and small crews have been engaged in cutting thistles. This is all routine work performed each year.

On the levees of the Sacramento By-pass, thistles are being cut, and an area in the by-pass is being grubbed preparatory to leveling, and repairs are being made to a number of washes along the south side revetment.

Sacramento Flood Control Project.

Several trips have been made with the District Engineer of the U. S. Engineer Office by launch, for the examination of the river banks requiring protection. These examinations have covered the Sacramento River from Sacramento to Moulton weir and the Feather River to a point 17 miles above Marysville.

Additional work of clearing has been done in the Yolo By-pass near the Southern Pacific trestle, completing this job.

Reports have been rendered on several applications before the Reclamation Board, and work being done under a number of previous applications has been inspected.

Mokelumne River.

Some channel rectification work has been done on the Howard and Garrison ranches, under Chapter 447. Statutes of 1929, consisting of moving certain trees and installing temporary protection of cabled trees and brush.

Russian River Jetty.

Work was commenced on June 1 at the Russian River, with a crew of eight men. Rock is being placed in the jetty at a satisfactory rate, the track and equipment have been placed in good condition, and the connection between the old work and the new steel trestle will be completed shortly. It is expected to deposit rock in the structure to the full capacity of the equipment.

Flood Measurements and Gages.

The San Joaquin River has remained at a low flood stage during this period and several discharge measurements have been taken. In the office, work of preparing reports covering all flood records from 1913 to date for publication in mimeographed form has continued.

WATER RIGHTS

Applications to Appropriate.

A complete list of the applications to appropriate water received and approved during the month of May will be found elsewhere in this issue. Twenty-four applications were received, 7 were denied and 16 were approved, 5 permits were revoked and 9 licenses were issued.

Activity continues to be particularly noticeable in connection with mining, as two of the larger applications received during the month were for mining purposes; one being by William F. Bickel to appropriate 25 second-feet in Nevada County from tributaries of Yuba River and the other being by Chas. E. Hudson and R. E. Colburn to appropriate 12 cubic feet per second from South Fork of Clear Creek, tributary to Klamath River.

LARGE DEMANDS

Among the more notable applications approved during the month was one by Woodbridge irrigation district allowing appropriation of 300 second-feet from Mokelumne River tributary to San Joaquin River at an estimated cost of \$51,600, for the irrigation of some 24,000 acres; one by Edward S. Moore and Santa Lucia Corp., Ltd., of San Francisco, to appropriate from coastal streams in Monterey County for domestic, recreational and subdivision purposes at an estimated cost of \$500,000; two applications by the Preston School of Industry to appropriate 10 second-feet and 2500 acre-feet per annum and 8.3 second-feet and 2500 acre-feet per annum, respectively, from Sutter Creek in Amador County at an estimated cost of \$75,000 each, and an application by Coronado Water Company of San Diego to appropriate 7.74 cubic feet per second and 614 acre-feet per annum for irrigation purposes from Tia Juana River in San Diego County at an estimated cost of \$508,000.

Inspection of projects under permit preparatory to the issuance of license or revocation continued during the month in Sacramento, San Joaquin, Contra Costa and Solano counties.

ADJUDICATIONS

Shasta River (Siskiyou County). A hearing on an order to show cause will be held before the Superior Court of Siskiyou County on June 24, 1932. The purpose of the order and the hearing thereon is to lay the foundation for entry of findings of fact and judgment in the Shasta River adjudication proceedings in the names of the true owners of the water rights and in accord with changes in interest which have occurred subsequent to entry of the Division's Order of Determination. Copies of the order to show cause were served on some 157 parties concerned with changes in ownership of water rights involved in the proceedings.

Whitewater River (San Bernardino and Riverside counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All-American canal from Colorado River.

River Dropping to Summer Levels

(Continued from preceding page)

Oak Run Creek (Shasta County). The Division's report as referee in the Oak Run Creek case was filed in the Superior Court of Shasta County on May 31, 1932. A proposed decree defining the water rights on Oak Run Creek has been approved by counsel for the parties at interest.

Clover Creek (Shasta County). Action on the case in the Superior Court of Shasta County is pending the outcome of negotiations for settlement by stipulation.

New Pine Creek (Modoc County). The Division's report as referee has been filed in the Superior Court of Modoc County, and a proposed decree defining the water rights on New Pine Creek has been circulated among counsel. The court set June 14, 1932, as the time for hearing exceptions to the report of referee and the proposed decree. There being no exceptions filed, the case is now pending entry of the court's decree.

Eagle Creek (Modoc County). The waters of Eagle Creek were distributed throughout the month in accordance with the plan for trial distribution adopted for the 1932 irrigation season.

South Fork Pit River (Modoc County). Field work on the investigation of the water supply and use of water on the South Fork Pit River was carried on throughout the month.

Cottonwood Creek (Modoc County). Field work on the investigation of the water supply and use of water on Cottonwood Creek was commenced on May 20, 1932.

Pine Creek in Surprise Valley (Modoc County). The suit of Evan R. Gaustad and Della V. Gustad vs. R. E. McCulley, et al., involving the determination of water rights on Pine Creek in Surprise Valley, Modoc County, was referred to the Division of Water Resources by the Superior Court of Modoc County by Order of Reference dated May 24, 1932. Field work on the investigation of the water supply and use of water on the stream system was commenced immediately following issuance of the Order of Reference.

WATER DISTRIBUTION

Burney Creek (Shasta County). Water master service for the 1932 season was commenced on Burney Creek about June 1.

Little Shasta River (Siskiyou County). Water master service for the 1932 season was commenced on Little Shasta River June 15.

Cedar, Davis, Deep, Eagle, Emerson, Franklin, Mill, New Pine, Owl, Pine and Soldier creeks and South Fork Pit River (Modoc County). Water master service on these streams was continued throughout the month.

Pit River in Big Valley (Modoc and Lassen counties). Supervision of diversions from Pit River in Big Valley continued throughout the month.

Hat Creek (Shasta County). Water master service on Hat Creek was continued throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Routine field work comprising the measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, has continued during the past month. In the San Joaquin Valley, recorders were installed and return water measurements started previous to the high water resulting from melting snow. During the recent period of the latter, the return water measurements have been temporarily discontinued and will be resumed when the high water has passed.

It appears that the peak of the Sacramento River run-off due to melting snow was reached some time ago and that the river at Sacramento is now dropping to summer levels.

Within the last two weeks a field party has been engaged in sounding the Sacramento River from Sacramento to Red Bluff to establish the relation between navigable depths and discharge of the river. Sampling at permanent salinity stations in the Upper Bay and Delta region and operation of the tide gages have been maintained. Recent salinity tests show the following:

Salinity Tests, Upper Bay and Sacramento-San Joaquin Delta, June 10, 1932

Station	Salinity in parts of chlorine per 100,000 parts of water
Point Orient -----	1120
Point Davis -----	880
Bullshead -----	76
Bay Point -----	6
O and A Ferry -----	1
Collinsville -----	1
Antioch -----	1
Emmaton -----	1
Jersey -----	1
Central Landing -----	1
Middle River P. O. -----	2

In the office, work has continued in completing the report for the 1931 season and the special report on losses in 1931 due to salinity and water shortage.

CALIFORNIA COOPERATIVE SNOW SURVEYS

No snow surveys were scheduled for the latter part of May but at that time there was considerable snow remaining at many of the key snow courses and a number of the cooperating agencies made and reported surveys. In general, for 8000-foot elevation and above, these showed a melting of the April 1st snow pack varying from about 20 per cent to 70 per cent north to south. For the measured courses below 8000 the melting averaged from 40 per cent to 100 per cent.

Routine and special office computations have continued during the past month. These included com-

Santa Clara Progress Report Issued

(Continued from page 33)

putations of natural flow at all stream gaging stations which will best reflect the snow run-off; keeping precipitation station records up to date; preparing the forms, set-up, and tabulation of all basic data needed in forecasting.

A field trip was made to shelter cabins now accessible to gather in equipment and supplies:

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties.) Work on the report covering the three years investigation of the Pit River was confined to assembling the physical data on several possible storage projects within the Pit River area preparatory to a study of the feasibility of these projects.

Napa Valley Investigation. It is anticipated that field work in connection with this investigation will close on July 1st and assembly of data preliminary to issuance of final report is in progress.

Santa Clara Investigation. Campbell, San Tomas, Berryessa and Penitencia creeks have continued to flow into the valley throughout the month and San Antonio Creek ceased to flow at Los Altos on May 13th. Observation of stages has continued on these creeks throughout the month and progress has been made in the office work in connection with computation of miscellaneous measurements made during the winter and spring.

SURVEY REPORT ISSUED

The progress report covering work of the year October 1, 1930 to September 30, 1931, was completed during the month. It is a mimeographed report of 47 pages and 4 plates dealing with stream flow, percolation and ground water storage in the Santa Clara Valley. The investigation was initiated by the Division of Water Resources in January, 1930, at the request of the Santa Clara Valley Water Conservation district and is of a cooperative nature.

It has as its object a general survey of the water resources of the Santa Clara Valley and was prompted by local apprehension arising out of the continued retreat of ground water throughout the valley, the average depth to ground water having increased from 33.4 feet in 1915 to 63.4 feet in 1921 and to 97.9 feet in the spring of 1930.

The report just released indicates that there was a further recession of 12.1 feet between the spring of 1930 and the spring of 1931. Data with respect to ground water levels is based upon observation of some 256 wells, the readings of the several wells being repeated in the report.

STREAM FLOWS COMPARED

One of the tables of the report shows a comparison of the flow of the principal streams debouching into the valley with the flow of the preceding year. Coyote River near Madrone discharged 1670 acre-feet as compared with 20,100 acre-feet in the preceding year and an average of 54,000 acre-feet for the 25 years of record, whereas the combined flow of Los Gatos Creek, Guadalupe Creek and Alamitos Creek

entering the valley measured only 1810 acre-feet as compared with 28,300 acre-feet in the preceding year.

Data in other tables of the report indicate that precipitation at the various observation stations throughout the valley varied between a minimum of 42 per cent and a maximum of 93 per cent of the averages for the periods of record which, of course, accounts for the abnormally low stream discharge.

The report is strictly a progress report and embodies less than three pages of text. It is largely a tabular presentation of basic data collected during the period October 1, 1930, to September 30, 1931, without any attempt to present analyses or conclusions. Only a very limited number of copies of the report were stricken off and these have been distributed among the libraries, governmental agencies, and public offices of the valley where they may be readily consulted by all interested parties.

An agreement is being executed for continuation of the investigation during the fiscal year 1932 and 1933.

VENTURA COUNTY INVESTIGATION

Drilling was resumed on the dam sites in Piru Creek with funds furnished under a cooperative agreement with the Division of Highways. Conflict exists between the utilization of certain reservoir sites on Piru Creek for highways or for storage of water. The new location of the Los Angeles-Bakersfield highway passes directly through the Spring Creek site and partially through the Los Alamos site.

STATE WATER PLAN

The California Water Resources Commission, appointed by Governor Rolph in August, 1931, consisting of nine citizens and six State officials as ex officio members, with Honorable Matt I. Sullivan, former Chief Justice of the Supreme Court of California, as chairman, rendered their report on the water problems of California to Governor Rolph under date of June 21, 1932. The Governor was well pleased and gratified with the report and stated: "This commission has rendered a great public service of which the people of California should justly be proud." The Governor has taken a keen and active interest, a broad, state-wide viewpoint and has exhibited outstanding leadership in evolving a plan for the solution of the State's most important and pressing problem.

Judge (sternly)—Well—what is your alibi for speeding 50 miles an hour?

George—I had just heard, your honor, that the ladies of my wife's church were giving a rummage sale and I was hurrying home to save my other pair of pants.

Judge—Case dismissed.

Driver: "I wasn't going forty miles an hour, nor thirty, nor even twenty."

Judge: "Here, steady now, or you'll be backing into something."

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

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BEAUTIFYING THE HIGHWAY

Among the various side projects that have been carried on during the last few years by the California Division of Highways, in connection with highway improvement generally, is the beautification of the immediate districts traversed by the major avenues of travel. One of the chief items has been the landscaping of the rights of way, including the scientific planting of wild flowers, shrubbery and other native growths.

Although the results have been increasingly apparent with each successive season since the work was started, the exceptionally fine growing weather this year has served to stress the success of the project along the Redwood Highway, particularly in southern Humboldt County. Acres of native California poppies, the lupine, the shrubs and innumerable other types of flora have converted the roadside into a panorama of color.

The department charged with the work is to be complimented upon the intelligence with which the problem has been approached. No attempt has been made to "gild the lily," so to speak, or to make any radical change in the original landscape. Rather, everything has been done with the view of combining the attractions of native and imported species.

One criticism of the Redwood Highway in the past has been directed at the lack of wild flowers along the route at certain seasons of the year. Happily, thanks to the highway people, this criticism can no longer hold true.—*Eureka Standard*.

A recent compulsory inspection of all motor vehicles in Pennsylvania revealed that approximately 85 per cent of the cars being operated on the highways required correction of some sort.

The color scheme of automobile license plates in Arizona for 1932 consists of white lettering on a copper colored background.

List of Intangible and Tangible Good Road Benefits Cited

IT HAS been found that people are strongly moved by intangible benefits from good roads such as comfort, convenience, social intercourse, freedom from mud, and the desire to see the home county a leader.

Intangible benefits may be listed as follows:

(1) Improved social advantages permit better intercourse between city and country, and bring country people closer together.

(2) The growth and prosperity of a section is improved through better transportation.

(3) Mail deliveries are bettered, fire protection improved, recreation facilities provided, healthfulness of the people increased, police protection afforded, home building facilitated, schools are consolidated for better instruction, and medical attention becomes more prompt.

(4) Personal pride in the good roads of a home county leads to loyalty and satisfaction.

Tangible benefits may be summarized:

(1) Increase the value of land. Farm values on improved roads are much higher than on dirt roads because of the better transportation facilities afforded. The highway is part of the farming plant.

(2) Lower motor vehicle costs. The maintenance costs of motor vehicles is much less than on improved roads and the depreciation is reduced. This may amount to several hundred dollars a year saving to each motor vehicle owner.

(3) Fuel costs are reduced. The consumption of gasoline on improved roads is much less than on dirt roads. The saving in fuel offsets the gasoline tax.

(4) Estimate of profit to the public. Estimating a saving of two cents a mile traveled, which is conservative for the saving on surfaced roads over dirt roads, each motor vehicle owner saves \$100 annually if he travels 5000 miles a year. An unimproved road that has 1000 vehicles a day traffic is losing \$7,300 a year in the form of increased operating costs. This is several times the cost of a fine country road. This loss is the "mud tax" paid by all people that travel the road. Good roads pay for themselves in a few years in savings.—

Daily Pacific Builder.

A survey reports that traffic accidents have decreased since the first of the year . . . Could this be attributed to the fact that this is leap year?—*L. A. Journal of Commerce.*

State Expends \$220,699 Annually to Maintain Safety Devices on Highways

By W. A. SMITH, Assistant Maintenance Engineer

THE ANNUAL expense of maintaining safety devices on State highways is nearly five cents out of every dollar expended for upkeep work. A review of expenditures during the year July 1, 1930, to June 30, 1931, shows that \$220,699 was expended for this type of work.

The largest single item in this amount was for the placing of the white traffic stripe. About 3500 miles of stripe is now in place, and requires renewal at least once each year. This includes the painting of the special stripes at grade crossings of railroads, and of "School Slow" signs each side of schools adjacent to the highways.

From expressions received from individuals and organizations the white stripe is regarded as a particularly valuable safety device. It serves to keep traffic, generally, in its own lane and is a well defined guide on mountain roads or in foggy areas during dark nights.

Some of the other safety features which require constant attention are as follows:

ROADSIDE GUARDS

On the highway system there is a considerable mileage of guard rail both of the old standard light two-rail construction, and the heavy 6" by 6" or laminated type. A great deal of this rail has been in place for a number of years, so that replacement is under way at various points each year. Likewise, it is necessary to repaint all the rail every three or four years at least.

On high fills and in mountain country where funds have not been available for standard guard rail construction, posts have been installed to outline the edge of the road. To make this warning effective it is very necessary that the posts be kept painted and in good condition.

Many pipe culverts were installed prior to the present requirement of an 8-foot shoulder width. The gradual widening out of the shoulder thus creates a hazard at such locations. The maintenance forces have accordingly installed posts to warn motor traffic of the danger. The replacement and painting of these posts is required.

LIGHTING UP CROSSINGS

Other safety measures are the red R X R neon signs, the illuminated electric signs, and electric flood lights at the more dangerous grade crossings which require monthly care and expense for electric power.

The most recent installation of this character consists of nine flood lights at grade crossings in the San Joaquin Valley. It was found that lack of illumination at crossings presented a particular hazard due to a long string of box cars which might be moving over the crossing, not being visible in the headlights of an approaching automobile until too late to avoid a serious crash.



W. A. SMITH

At several grade crossings on which the railroad traffic is light, large reflectorized signs have been installed.

Within the last two years the State has assumed the cost of providing electric power for flasher signals at hazardous locations. These flashers were originally installed by one of the automobile clubs at their own expense.

REFLECTORIZED SIGNS

Designs have been developed for reflectorized directional signs at certain locations.

These signs have been installed by the two larger automobile associations in the north and south, respectively. The expense of the installation is borne by the State.



SENTINELS OF SAFETY are these devices maintained by the State on its highways to guard the motorists who oftentimes react unconsciously to the warnings they convey. No. 1—Neon sign at railroad crossings. No. 2—Reflectorized intersection warning illuminated at night by approaching headlights. No. 3—Railroad crossing warning with red reflectorized center and flasher post signal. No. 4—Standard rock guard rail on sea wall. No. 5—Floodlights to show trains on crossings. No. 6—White wood marker posts on road shoulders. No. 7—Culvert head-wall marker post. No. 8—Night view of neon crossing sign. No. 9—Traffic stripe and guard rails.

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources during the month of June, 1932.

LASSEN COUNTY—Rager Dam No. 226. Geo. F. Rager, Ravendale, owner; earth, 5 feet above streambed with a storage capacity of 1000 acre-feet, situated on Cold Spring Creek tributary to Madeline Plains in Sec. 6, T. 35 N., R. 16 E., M. D. B. and M. For storage purposes for irrigation use.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources during the month of June, 1932.

MODOC COUNTY—Pope Dam No. 165. Lizzy Pope, Canby, owner; buttress and flashboards, situated on Pit River tributary to Sacramento River in Sec. 2, T. 41 N., R. 9 E., M. D. B. and M.

KERN COUNTY—Lake of the Woods Dam No. 733. Mr. and Mrs. J. D. Cuddy, Lebec, owner; earth, situated on Cuddy Canyon in Sec. 33, T. 9 N., R. 20 W., S. B. B. and M.

MONTEREY COUNTY—San Carlos Dam, No. 644. Rancho San Carlos, Inc., Monterey, owner; earth and rock, situated on Garzas Creek tributary to Carmel River in Sec. 18, T. 17 S., R. 2 E., M. D. B. and M.

SAN MATEO COUNTY—Reflection Lake Dam No. 606. California Pacific Title and Trust Company, San Francisco, owner; earth, situated on unnamed stream tributary to La Honda Creek in Sec. 14, T. 7 S., R. 4 W., M. D. B. and M.

MONTEREY COUNTY—Forest Lake Dam No. 642-2. Monterey County Water Works, Pacific Grove, owner; earth, located in El Pescadero Rancho.

MODOC COUNTY—Duke Reservoir No. 2, No. 163-2. Royal E. Williams, Likely, owner; earth, situated on flat tributary to South Fork Pit River in Sec. 16, T. 39 N., R. 13 E., M. D. B. and M.

SAN DIEGO COUNTY—Lake Wohlford Dam No. 834. Escondido Water Company, Escondido, owner; earth and rock, situated on Segern Creek tributary to Escondido Creek in Sec. 5, T. 12 S., R. 1 W., S. B. B. and M.

MODOC COUNTY—Hughes Dam No. 166. H. C. Hughes, Canby, owner; buttress and flashboards, situated on Pit River tributary to Sacramento River in Sec. 30, T. 42 N., R. 10 E., M. D. B. and M.

CALAVERAS COUNTY—San Mateo Produce Co. Dam No. 495. California Lands, Inc., Stockton, owner; earth, located in Sec. 4, T. 3 N., R. 10 E., M. D. B. and M.

FRESNO COUNTY—Meadow Lakes Dam No. 695. Alva E. Snow, Fresno, owner; earth, located in Sec. 11, T. 10 S., R. 23 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 1 Dam No. 230. August Anderson, Ravendale, owner; earth, located in Sec. 22, T. 36 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 2 Dam No. 230-2. August Anderson, Ravendale, owner; earth, located in Sec. 3, T. 35 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 3 Dam No. 230-3. August Anderson, Ravendale, owner; earth, located in Sec. 4, T. 35 N., R. 16 E., M. D. B. and M.

CALAVERAS COUNTY—Ross Dam No. 99-3. Emma Rose and Hobart Estate, San Francisco, owner; masonry arch, situated on San Domingo Creek tributary to Calaveras River in Sec. 14, T. 3 N., R. 13 E., M. D. B. and M.

LASSEN COUNTY—Biscar Dam No. 251. Peter Biscar, Karlo, owner; earth, situated on Snow Storm Creek tributary to Secret Valley in Sec. 18, T. 31 N., R. 15 E., M. D. B. and M.

MONTEREY COUNTY—Pacific Grove Dam, No. 642-3. Central Calif. Water Supply Co., Pacific Grove, owner; earth, located in Punta Pinos Rancho.

LASSEN COUNTY—Meadow Brook Dam No. 229. L. R. Cady and Frank Coffin, Susanville, owner; masonry, situated on Baxter Creek tributary to Honey Lake in Sec. 26, T. 29 N., R. 12 E., M. D. B. and M.

LOS ANGELES COUNTY—Saw Pit Dam No. 32-12. Los Angeles County Flood Control Dist., Los Angeles, owner; arch, situated on Sawpit Creek tributary to

San Gabriel River in Sec. 13, T. 1 N., R. 11 W., S. B. B. and M.

LOS ANGELES COUNTY—Johnson Lake Dam No. 19-2. City of Pasadena, Pasadena, owner; earth, situated on a draw tributary to Arroyo Seco.

LOS ANGELES COUNTY—Twin Lakes Park Dam No. 774-2. Twin Lakes Park Company, Los Angeles, owner; gravity, situated on De Los Aliso Creek tributary to Brown's Canyon in Sec. 7, T. 2 N., R. 16 W., S. B. B. and M.

CALAVERAS COUNTY—Salt Springs Valley Res. No. 496. The California Company, Stockton, owner; rock, situated on Rock Creek tributary to Littlejohn Creek in Sec. 16, T. 2 N., R. 11 E., M. D. B. and M.

MODOC COUNTY—Mud Lake Dam No. 129-5. Thomas Raker, C. A. and Iva S. Raker, Alturas, owner; earth and rock, situated on unnamed stream tributary to North Fork Pit River in Sec. 20, T. 43 N., R. 13 E., M. D. B. and M.

PLACER COUNTY—Clover Valley Dam No. 97-16. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Antelope River tributary to Sacramento River in Sec. 28, T. 12 N., R. 7 E., M. D. B. and M.

AMADOR COUNTY—Henderson Forebay Dam No. 1-11. Preston School of Industry, Waterman, owner; earth, tributary to Sutter Creek, located in Sec. 18, T. 6 N., R. 10 E., M. D. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of June, 1932.

LOS ANGELES COUNTY—San Gabriel No. 1 Dam No. 32-19. Los Angeles County Flood Control District, Los Angeles, owner; rock, 300 feet above streambed with a storage capacity of 68,000 acre-feet, situated on San Gabriel River in Sec. 6, T. 1 N., R. 9 W., S. B. B. and M. For storage purposes for flood control and conservation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources during the month of June, 1932.

TRINITY COUNTY—Lower Stuarts Fork Dam No. 212. La Grange Placers, Ltd., Weaverville, owner; masonry, situated on Stuarts Fork tributary to Trinity River in Sec. 3, T. 36 N., R. 10 E., M. D. B. and M.

KERN COUNTY—Lake of the Woods Dam No. 733. Mr. and Mrs. J. D. Cuddy, Lebec, owner; earth, situated on Cuddy Canyon in Sec. 33, T. 9 N., R. 20 W., S. B. B. and M.

MONTEREY COUNTY—San Carlos Dam No. 644. Rancho San Carlos, Inc., Monterey, owner; earth and rock, situated on Garzas Creek tributary to Carmel River in Sec. 18, T. 17 S., R. 2 E., M. D. B. and M.

SAN DIEGO COUNTY—Cuyamaca Dam No. 56. La Mesa Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; earth, situated on Boulder Creek in Por. of Lots D, E and G, Cuyamaca Rancho.

ORANGE COUNTY—South Lambert Dam No. 793. The Irvine Company, Tustin, owner; earth, located in Lot 368, Irvine's subdivision.

MONTEREY COUNTY—Forest Lake Dam No. 642-2. The Monterey County Water Works, Pacific Grove, owner; earth, located in El Pescadero Rancho.

SAN MATEO COUNTY—Reflection Lake Dam No. 606. California Pacific Title and Trust Company, San Francisco, owner; earth, situated on unnamed stream tributary to La Honda Creek in Sec. 14, T. 7 S., R. 4 W., M. D. B. and M.

MODOC COUNTY—Duke Reservoir No. 2 No. 163-2. Royal E. Williams, Likely, owner; earth, situated on a flat tributary to South Fork Pit River in Sec. 16, T. 39 N., R. 13 E., M. D. B. and M.

SAN DIEGO COUNTY—Lake Wohlford Dam No. 834. Escondido Mutual Water Company, Escondido, owner; earth and rock, situated on Segern Creek tributary to Escondido Creek in Sec. 5, T. 12 S., R. 1 W., S. B. B. and M.

June Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of June, 1932.

SIERRA COUNTY—Application 7275. George McGee, Blairsden, California, for 1.0 c.f.s. from 3 unnamed springs tributary to Howard Creek, thence North Fork of North Fork of Yuba River, to be diverted in Secs. 24 and 25, T. 21 N., R. 12 E., M. D. B. and M. For power and domestic purposes. (25.6 h.p.)

ALPINE COUNTY—Application 7276. State of California, Department of Public Works, Division of Highways, District X, c/o C. H. Purcell, State Highway Engineer, Public Works Bldg., Sacramento, California, for 0.005 c.f.s. from unnamed spring tributary to West Fork Carson River to be diverted in Sec. 31, T. 11, R. 19 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

EL DORADO COUNTY—Application 7277. United States, El Dorado National Forest, Placerville, California, for 1000 gallons per day from unnamed stream tributary to Upper Echo Lake to be diverted in Sec. 35, T. 2 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$150.

EL DORADO COUNTY—Application 7278. United States, El Dorado National Forest, Placerville, California, for 1200 gallons per day from Indian Rock Creek tributary to Lily Lake and Fallen Leaf Lake to be diverted in Sec. 22, T. 12 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$150.

EL DORADO COUNTY—Application 7279. United States, El Dorado National Forest, Placerville, California, for 6000 gallons per day from Scout Springs tributary to South Fork of American River to be diverted in Sec. 7, T. 11 N., R. 18 E., M. D. B. and M. For domestic purposes. Estimated cost \$3,000.

PLACER COUNTY—Application 7280. Paul H. Norboe, 3920 2d Ave., Sacramento, California, for 250 c.f.s. and 200,000 acre-feet per annum from Middle Fork of American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For power purposes. (119,319 h.p.) Estimated cost \$18,000,000.

PLACER COUNTY—Application 7281. Paul H. Norboe, 3920 2d Ave., Sacramento, California, for 250 c.f.s. and 200,000 acre-feet per annum from Middle Fork American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For municipal purposes. Estimated cost \$15,000,000.

SISKIYOU COUNTY—Application 7282. Willis W. Quigley, c/o James D. Fairchild, attorney, Yreka, California, for 1 c.f.s. from Beaver Creek tributary to Klamath River to be diverted in Sec. 31, T. 47 N., R. 8 W., M. D. B. and M. For power purposes. (5.7 h.p.)

SISKIYOU COUNTY—Application 7283. Mark Packard, c/o Allen and McNamara, attorneys, Allen Building, Yreka, California, for 40 c.f.s. from Elk Creek tributary to Klamath River to be diverted in Sec. 30, T. 15 N., R. 8 E., H. B. and M. For mining purposes. Estimated cost \$158,000.

TEHAMA COUNTY—Application 7284. H. H. Hammer, Red Bluff, California, for 3 c.f.s. from South Fork Cottonwood Creek tributary to Sacramento River to be diverted in Sec. 12, T. 26 N., R. 8 W., M. D. B. and M. For power purposes. (17 h.p.) Estimated cost \$100.

EL DORADO COUNTY—Application 7285. B. W. Stone, room 221, 16 California St., San Francisco, California, for 500 c.f.s. and 125,000 acre-feet per annum from (1) Rubicon River, (2) Pilot Creek, (3) Gerle Creek, (4) Loon Lake, (5) Buck Island Lake, (6) Rock Bound Lake, (7) Little South Fork Rubicon River tributary to American River drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E., Sec. 9, T. 12 N., R. 12 E.; Sec. 24, T. 13 N., R. 13 E.; Secs. 11-31-34, T. 14 N., R. 14 E.; Sec. 4, T. 13 N., R. 15 E.; Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

MONO COUNTY—Application 7286. Geo. J. Davlin, 5157 8th Ave., Los Angeles, California, for 100 gallons per day from unnamed stream tributary to Twin Lakes tract, thence Mammoth Creek, Hot Creek and Owens River to be diverted in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M. For Domestic Purposes. Estimated cost \$60.

EL DORADO COUNTY—Application 7287. Geo. W. Shedd, Kyburz, California, for 0.005 c.f.s. from 3 unnamed springs tributary to Pyramid Creek, thence S. Fork American River, to be diverted in section 8, T. 11 N., R. 17 E., M. D. B. and M. For recreational and domestic purposes. Estimated cost \$500.

DEL NORTE COUNTY—Application 7288. Frank Symms, Crescent City, California, for 0.01 c.f.s. from unnamed creek tributary to Smith River to be diverted in Sec. 30, T. 17 N., R. 2 E., H. B. and M. For domestic purposes. Estimated cost \$200.

SANTA CRUZ COUNTY—Application 7289. Theodore J. Hoover, Stanford University, California, for 1800 acre-feet per annum from Waddell Creek tributary to Pacific Ocean to be diverted in Sec. 35, T. 9 S., R. 4 W., M. D. B. and M. For irrigation purposes, (1000 acres.) Estimated cost \$25,000.

MONO COUNTY—Application 7290. Louis A. Smith, Box 53, Mono Lake, California, for 16 acre feet per annum from Bridgeport Canyon Creek tributary to Mono Lake to be diverted in Sec. 23, T. 3 N., R. 26 E., M. D. B. and M. For irrigation and domestic purposes, (80 acres.) Estimated cost \$500.

SHASTA COUNTY—Application 7291. Wm. L. Harris, trustee, 375 Mills Bldg., San Francisco, California, for 14 c.f.s. from Brandy Creek tributary to Clear Creek and Sacramento River to be diverted in Sec. 19, T. 32 N., R. 6 W., M. D. B. and M. For mining and domestic purposes. Estimated cost \$5,000.

INYO COUNTY—Application 7292. Joseph W. Rossi, Bishop, California, for 0.5 c.f.s. from Crystal Spring tributary to Owens River watershed to be diverted in Sec. 26, T. 7 S., R. 32 E., M. D. B. and M. For irrigation and domestic purposes. Estimated cost \$1,500.

SIERRA COUNTY—Application 7293. Taber Development Company, 928 Bank of America Bldg., Stockton, California, for (1) 15, (2) 35, total 50 c.f.s. from (1) Deams Ravine, (2) South Fork Canyon Creek tributary to (1) Canyon Creek and (2) Yuba River to be diverted in section (1) 7, T. 21 N., R. 11 E., (2) section 12, T. 21 N., R. 10 E., M. D. B. and M. For mining purposes.

ALPINE COUNTY—Application 7294. J. E. Taylor and L. H. Honey, c/o J. E. Taylor, Oakley, California, for 400 gallons per day from spring tributary to Twin Lakes and South Fork American River to be diverted in section 18, T. 10 N., R. 18 E., M. D. B. and M. For domestic purposes. Estimated cost \$400.

PLUMAS COUNTY—Application 7295. State of California, Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, California, for 2160 gallons per day, from Hillside Spring tributary to Spanish Creek, thence East Branch of North Fork of Feather River and North Fork Feather River, to be diverted in section 10, T. 25 N., R. 9 E., M. D. B. and M. For recreational purposes. Estimated cost \$25.

RIVERSIDE COUNTY—Application 7296. Chapman Blackburn, c/o Dr. F. K. Strasser, Kimball and Carmalita, Hemet, California, for 0.025 c.f.s. from spring tributary to Jacinto River watershed, to be diverted in section 30, T. 5 S., R. 1 E., S. B. B. and M. For domestic and stock watering purposes.

SAN DIEGO COUNTY—Application 7297. John R. La Dow, Pala, California, for 0.5 c.f.s. from unnamed stream tributary to San Luis Rey River, to be diverted in section 20, T. 9 S., R. 2 W., S. B. B. and M. For irrigation and domestic purposes. (40 acres.) Estimated cost \$500.

TUOLUMNE COUNTY—Application 7298. State of California, Department of Public Works, Division of Highways, Dist. X, by C. H. Purcell, State Highway Engineer, Public Works Bldg., Sacramento, California, for 5000 gallons per day from Simms Spring tributary to Cascade Creek thence Middle Fork Stanislaus River to be diverted in section 14, T. 5 N., R. 18 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

SAN LUIS OBISPO COUNTY—Application 7299. Security First National Bank of Los Angeles, c/o First Securities Co., Ltd., Pacific S. W. Bank Bldg., Los Angeles, California, for 0.31 c.f.s. from Salinas River tributary to Monterey Bay, to be diverted in sections 20 and 21, T. 30 S., R. 15 E., M. D. B. and M. For irrigation purposes. (77 acres.) Estimated cost \$5,000.

Applications and Permits Granted

(Continued from page 39)

SISKIYOU COUNTY—Application 7300. William Wilke, Sawyers Bar, California, for 2.5 c.f.s. from East Fork Eddy's Gulch tributary to Eddy's Gulch, thence North Fork Salmon River, to be diverted in section 15, T. 29 N., R. 11 W., M. D. B. and M. For mining and domestic purposes.

SAN BERNARDINO COUNTY—Application 7301. J. K. Wilden, Route 1, Box 176, Colton, California, for 0.75 c.f.s. from unnamed drainage ditch tributary to Santa Ana River, to be diverted in section 5, T. 2 S., R. 4 W., S. B. B. and M. For irrigation purposes. (.927 acres.) Estimated cost \$5.

NEVADA CITY—Application 7302. Relief Hill Mining Company, North Bloomfield, California, for 50 c.f.s. from North Fork of Poormans Creek tributary to South Fork Yuba River, to be diverted in section 9, T. 18 N., R. 11 E., M. D. B. and M. For mining purposes. Estimated cost \$10,000.

DEL NORTE COUNTY—Application 7303. Austin McAfee, Crescent City, California, for 3 c.f.s. from Moores Gulch tributary to Smith River, to be diverted in section 3, T. 16 N., R. 1 E., H. B. and M. For mining and domestic purposes.

EL DORADO COUNTY—Application 7304. Mrs. Eurette Callnon, 3109 E Street, Sacramento, California, for 200 gallons per day from unnamed spring tributary to Bryant Creek and South Fork American River, to be diverted in section 15, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes.

EL DORADO COUNTY—Application 7305. Alice M. Coughlin, 751 42d Street, Sacramento, California, for 200 gallons per day from a spring tributary to South Fork American River, to be diverted in section 15, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes.

SONOMA COUNTY—Application 7306. Frank Weaver, c/o A. R. Grinstead, attorney, Sonoma, California, for 1.0 c.f.s. from Sonoma Creek tributary to San Pablo Bay, to be diverted in section 35, T. 6 N., R. 6 W., M. D. B. and M. For irrigation purposes. (12 acres.) Estimated cost \$450.

EL DORADO COUNTY—Application 7307. R. W. Spencer, R. Weldon, E. F. Curtis and Mrs. Hazel Stahl, c/o R. W. Spencer, 3429 Folsom Boulevard, Sacramento, California, for 800 gallons per day from unnamed spring tributary to South Fork American River, to be diverted in section 8, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$500.

COLUSA COUNTY—Application 7308. J. L. Brown- ing, c/o Chas. De St. Maurice, Colusa, California, for 12 c.f.s. from Sacramento River tributary to Suisun Bay, to be diverted in section 22, T. 14 N., R. 1 E., M. D. B. and M. For irrigation purposes. (.923.6 acres.)

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of June, 1932.

YOLO COUNTY—Permit 3903, Application 7232. Rose Vargas Rose, 3709 Bigler Way, Sacramento, California, June 2, 1932, for 0.32 c.f.s. from Sacramento River tributary to Suisun Bay in section 22, T. 7 N., R. 4 E., M. D. B. and M. For irrigation of 26 acres.

SAN MATEO AND SANTA CRUZ COUNTIES—Permit 3904, Application 7005. Humphrey Estates, Inc., 315 Montgomery Street, San Francisco, California, June 3, 1932, for 195 acre-feet per annum from Green Oaks Creek in section 30, T. 9 S., R. 4 W., M. D. B. and M. For domestic and irrigation of 285 acres.

TRINITY COUNTY—Permit 3905, Application 7075. Lee Nafsgar, Del Loma, California, June 4, 1932, for 6 c.f.s. from Langs Creek tributary to Trinity River in section 31, T. 5 N., R. 8 E., H. B. and M. For mining and domestic purposes. Estimated cost \$5,000.

TRINITY COUNTY—Permit 3906, Application 7190. French Bar Mining Company, Del Loma, California, June 4, 1932, for 10 c.f.s. from Big French Creek tributary to Trinity River in section 29, T. 5 N., R. 8 E., H. B. and M. For mining and domestic purposes. Estimated cost \$1,800.

SAN BERNARDINO COUNTY—Permit 3907, Application 6897. Effel Rudy, Fenner, California, June 6, 1932, for 0.025 c.f.s. from underground water in section

28, T. 8 N., R. 18 E., S. B. B. and M. For domestic purposes. Estimated cost \$3,000.

LASSEN COUNTY—Permit 3908, Application 6413. Antonio Saralegui, Reno, Nevada, June 7, 1932, for 600 acre-feet per annum from Long Valley Creek tributary to Honey Lake in section 16, T. 23 N., R. 17 E., M. D. B. and M. For domestic and irrigation of 166.71 acres of alfalfa in sections 10, 11 and 15, T. 23 N., R. 17 E., M. D. B. and M. Estimated cost \$1,600.

PLACER COUNTY—Permit 3909, Application 7239. C. W. Earle, Rocklin, California, June 7, 1932, for 0.10 c.f.s. from Secret Ravine tributary to Dry Creek thence Sacramento River in section 20, T. 11 N., R. 7 E., M. D. B. and M. For irrigation of 8 acres. Estimated cost \$500.

SAN MATEO COUNTY—Permit 3910, Application 6250. Cella Tobin Clark, San Mateo, California, June 7, 1932, for 0.15 c.f.s. and 100 acre feet per annum from Peters Creek and 5 tributaries, tributary to Pescadero Creek in section 28, T. 7 S., R. 3 W., M. D. B. and M. For irrigation, domestic and stock, on 130 acres. Estimated cost \$30,000.

MONO COUNTY—Permit 3911, Application 7170. Elbert E. English, 1132 Pine Avenue, Long Beach, California, June 7, 1932, for 200 gallons per day from Rock Creek tributary to Owens River, in section 33, T. 4 S., R. 30 E., M. D. B. and M. For domestic purposes. Estimated cost \$25.

MONO COUNTY—Permit 3912, Application 7219. United States Inyo National Forest, Bishop, California, June 15, 1932, for 0.006 c.f.s. from unnamed stream tributary to Mammoth Creek, Hot Creek and Owens River in section 9, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes.

SIERRA COUNTY—Permit 3913, Application 7216. Chas. J. Scanlon, Jr., Camptonville, California, June 15, 1932, for 3 c.f.s. from South Fork of North Fork of Indian Creek and North Fork Indian Creek tributary to Yuba River in section 21, T. 19 N., R. 9 E., M. D. B. and M. For domestic and placer mining purposes.

TRINITY COUNTY—Permit 3914, Application 7060. United Placers, Ltd., 600 S. Madison Street, Pasadena, California, June 15, 1932, for 100 c.f.s. from Canyon Creek, tributary to Trinity River in section 17, T. 35 N., R. 10 W., M. D. B. and M. For mining and domestic purposes. Estimated cost \$150,000.

TRINITY COUNTY—Permit 3915, Application 7067. Buckeye Placer Mines, Inc., Carrville, California, June 15, 1932, for 15 c.f.s. from Little Boulder Creek, tributary to Mojave Desert in section 5, T. 3 N., R. 1 W., S. B. B. and M. For domestic and irrigation of 20 acres in SW-NW, section 29, T. 4 N., R. 1 W., S. B. B. and M. Estimated cost \$20.

SAN BERNARDINO COUNTY—Permit 3916, Application 6714. Mary Frances Bird, Victorville, California, June 16, 1932, for 0.25 c.f.s. from Ruby Springs tributary to Mojave Desert in section 5, T. 3 N., R. 1 W., S. B. B. and M. For domestic and irrigation of 20 acres in SW-NW, section 29, T. 4 N., R. 1 W., S. B. B. and M. Estimated cost \$20.

EL DORADO COUNTY—Permit 3917, Application 6992. E. S. Wilson, et al., c/o E. S. Wilson, box 512, Davis, California, June 18, 1932, for 1400 gallons per day from Rocky Canyon tributary to American River in section 7, R. 11 N., R. 17 E., M. D. B. and M. For domestic purposes.

SAN DIEGO COUNTY—Permit 3918, Application 7038. United States Cleveland National Forest, 310 Federal Bldg., San Diego, California, June 18, 1932, for 0.066 c.f.s. from surface water of Vallecitos Spring No. 2, tributary to Vallecitos Spring and Salton Sea in section 34, T. 14 S., R. 5 E., S. E. B. and M. For domestic purposes. Estimated cost \$2,000.

EL DORADO COUNTY—Permit 3919, Application 7070. George E. De Golia, 5960 Contra Costa Road, Oakland, California, June 18, 1932, for 200 gallons per day from unnamed stream tributary to South Fork American River in section 24, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes.

HUMBOLDT COUNTY—Permit 3920, Application 7211. Fred Bair, Standard Bldg., Eureka, California, June 20, 1932, for 0.062 c.f.s. from Bair Creek tributary to Humboldt River in section 36, T. 10 N., R. 4 E., H. B. and M. For domestic purposes and irrigation of 5 acres in section 36. Estimated cost \$500.

STATE OF CALIFORNIA

Department of Public Works

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COLONEL WALTER E. GARRISON-----Director

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JOHN W. HOWE, Secretary
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C. S. POPE, Construction Engineer
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F. W. PANHORST, Acting Bridge Engineer
R. H. STALNAKER, Equipment Engineer
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L. H. GIBSON, District V, San Luis Obispo
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S. V. CORTELYOU, District VII, Los Angeles
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J. W. VICKREY (Acting), District IX, Bishop
R. E. PIERCE, District X, Sacramento
General Headquarters, Public Works Building,
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EVERETT N. BRYAN, Hydraulic Engineer, Water
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J. W. DUTTON, General Superintendent Construction
W. H. ROCKINGHAM, Mechanical Engineer
C. A. HENDERLONG, Assistant Mechanical Engineer
W. M. CALLAHAN, Electrical Engineer

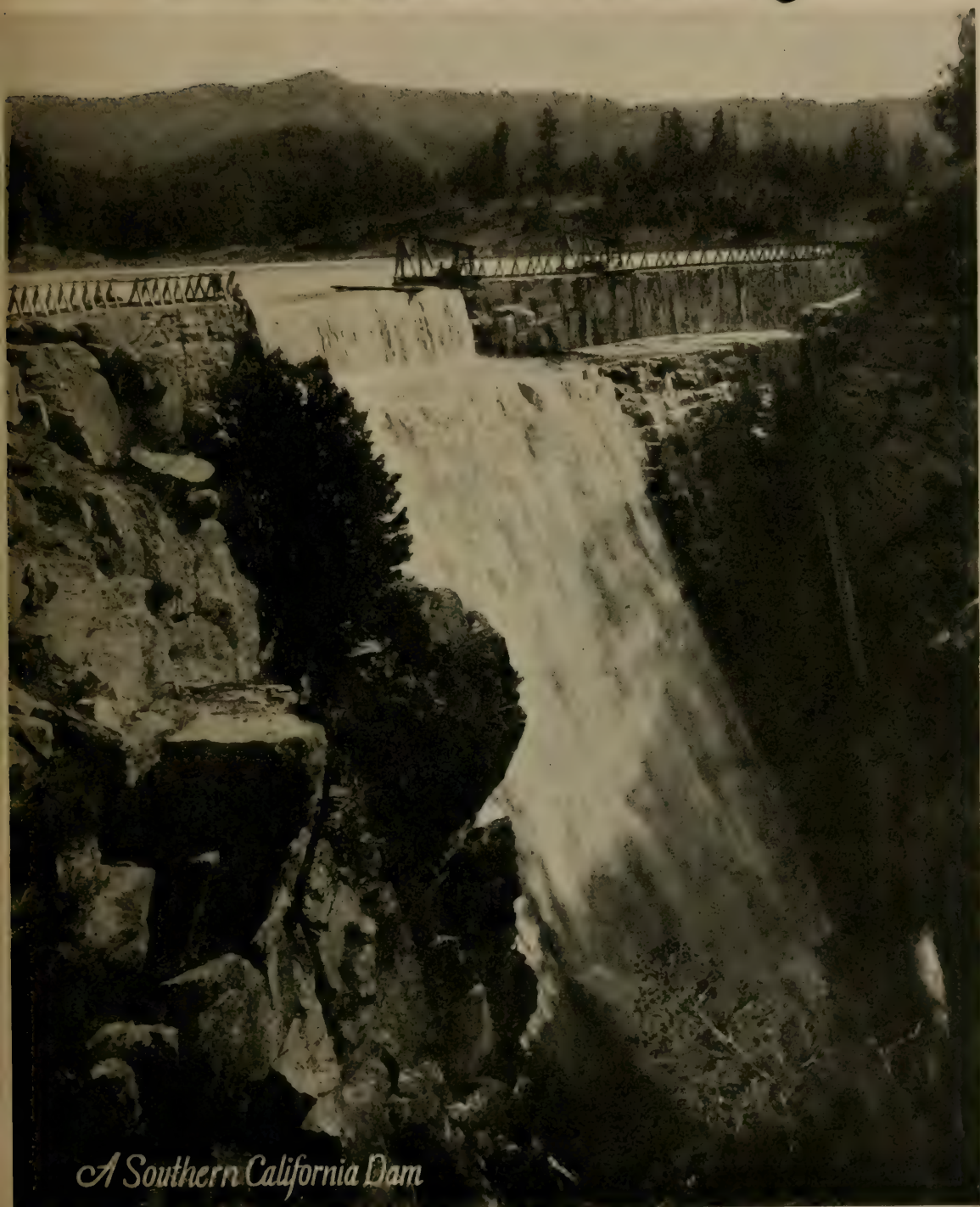
DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed
Port of San Diego—Edwin P. Sample

California Highways and Public Works




A Southern California Dam

Official Journal of the Department of Public Works
AUGUST State of California 1932



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\$31,904,000 Dam Building Program Under Way in Southern California

Department of Public Works Approves and Supervises Great Conservation and Flood Control Projects Giving Employment to Thousands of Workers

By EDWARD HYATT, State Engineer

THE Department of Public Works, through the State Engineer, has been charged since 1929 with the responsibility of approval of plans and supervision of construction and maintenance of all dams in California above a minimum size. At the present time and during the last year the main activity in the building of new dams has been in Southern California.

Including dams which will soon be started, dams under construction and dams recently completed, there will be added to the water storage in southern California about 387,000 acre-feet at an approximate cost of \$31,904,000.

Before construction of a dam can be started, plans and specifications must be approved by the State Engineer, who also supervises construction from start to finish, and when the structure is completed issues a certificate of approval, certifying that the dam is safe. The tendency in dam building is to design higher structures of greater storage capacity, which results in greater potential menace than was the case a decade ago when smaller dams were the rule.

GREAT RESPONSIBILITY

The responsibility resting upon the State office in approving the design and supervising construction of new dams as well as

passing upon those already built is very great, as it may result in increasing the cost to the owners in large amounts, and may even cause abandonment of a dam on which much money has been expended; **but more important it means that the State office must undertake the grave duty of assuring people living below a dam and the public generally that all reasonable safeguards have been observed in its construction and that lives and property will not be jeopardized thereby.**



EDWARD HYATT

The great dam building program now under way in southern California may be called a three-phase plan. First, it will conserve a vital natural resource; second it will protect lives and property from destructive floods; and third, it will materially help the critical unemployment problem by putting many thousands of men to work on necessary public improvements. In reviewing applications and plans for dams which require large expenditures and employment of many men the State office has cooperated with the own-

ers to clear the way for construction at the earliest date possible in order to reach the unemployment problem quickly and effectively.

VITAL PROBLEM

Water is the first consideration in the economic development and continued prosperity

(Continued on page 10)

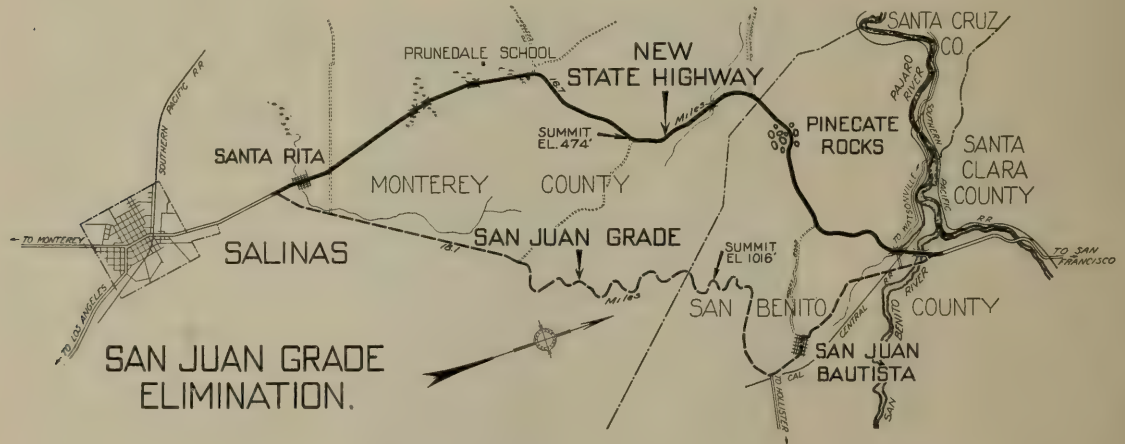
Prunedale "Cut-off," Bypassing Old San Juan Grade, Opened With Ceremony

By G. A. TILTON, JR., District Construction Engineer

STATE HIGHWAY progress was again recorded when the "Prunedale Cut-off," eliminating the old San Juan Grade in Monterey and San Benito Counties, was opened to traffic on July 20, 1932. Automobile travelers bound to the Olympiad at Los Angeles, who selected the Coast Highway (U. S. Route 101) from San Francisco to Los Angeles were greeted with a new highway unit 16.7 miles in length, safe, fast, and comfortably convenient, contrasting the narrow, twisting, dangerous San Juan Grade, obsolete after seventeen years of service.

Amid the picturesque surroundings of the beautiful "Pinecate Rocks" of bandit lore, 300 people gathered to witness the formal

events leading up to the final construction of the "Prunedale Cut-Off" and elimination of the San Juan Grade. Other speakers and participating officials were: Charles H. Purcell, State Highway Engineer; Timothy A. Reardon, State Highway Commissioner; Harry A. Hopkins, State Highway Commissioner; Lester H. Gibson, State Highway District Engineer; John W. Howe, Secretary State Highway Commission; Robert Sterling, Monterey County Supervisor; George Dudley, Chairman Monterey County Supervisors; A. A. Caruthers, Monterey County Supervisor; Howard Cozzens, Monterey County Engineer, and A. G. Turner, Chairman San Benito County Supervisors.



opening, attended by prominent State and county officials.

Ceremonies were conducted under the auspices of the California State Chamber of Commerce, presided over by A. E. Roth, Regional Director of that body. Governor James Rolph, Jr., was unable to attend because of the serious illness of his brother, and conveyed his regrets through his spokesmen, Colonel Walter E. Garrison, Director of the Department of Public Works, and Earl Lee Kelly, Chairman of the State Highway Commission.

RELATED HISTORY

George Gould, President of the Salinas Chamber of Commerce, related the history of

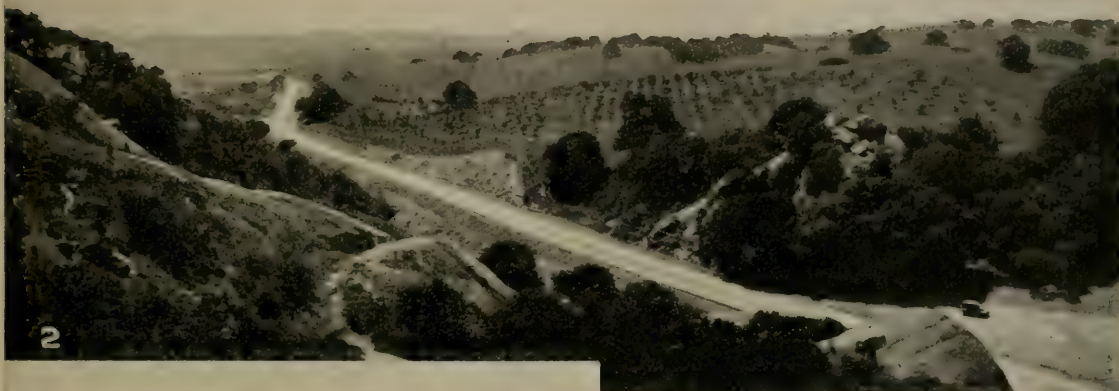
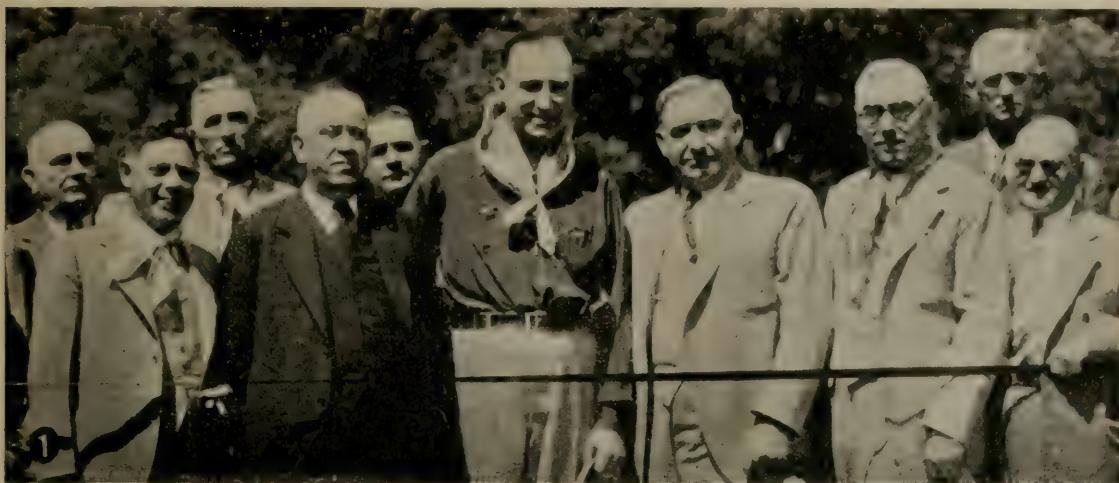
Completion of this most important unit of the Coast Highway culminates six years of engineering studies, surveys, public meetings, and conferences of State and county officials.

Only by rushing construction activities with day and night shifts was it possible to successfully overcome unexpected delays caused by heavy winter rains and complete the new highway in time to throw it open to Olympiad traffic as well as for the opening day of the popular Salinas Rodeo.

UNUSUAL PROBLEMS INVOLVED

The newly constructed unit leaves the existing highway two miles north of Salinas and passes over rolling mesas and winds through scenic valleys, joining the existing highway

(Continued on page 22)



BREASTING THE TAPE at the Prunedale Cut-off dedication ceremony in picture No. 1, left to right in the front row, are the following Highway officials: Commissioner Harry A. Hopkins, Commissioner Timothy A. Reardon, Commission Chairman Earl Lee Kelly, Colonel Walter E. Garrison, Director of Public Works; C. H. Purcell, State Highway Engineer, and John W. Howe, Commission Secretary. No. 2 shows the wide, safe, fast new highway that runs for 16.7 miles through scenic valleys and over rolling mesas, eliminating the narrow, steep, tortuous old San Juan Grade. No. 3 shows the highway at the Pinecate Rocks, famed as an ancient bandit lair, and in picture No. 4 is seen the 8-foot by 10-foot culvert under construction that carries a creek channel under the pavement.

Gold Run-Airport Project Abolishes Three Grade Crossings on U. S. 40

By CHARLES H. WHITMORE, District Engineer

IN THE early part of 1933, should prescribed work adhere to schedule, that portion of State Highway Route 37 between Auburn and Truckee will consist entirely of high speed, modern highway.

The last section of what only a short time as a decade ago was merely a wagon trail is now being replaced by a \$400,000 grading and preliminary surfacing project, of ample width, easy grades and alignment. The final section is located between Gold Run and Airport and, in spite of the work of removing the last vestige of the old type of road transportation, the old order is linked nevertheless with the new by the vernacular of the termini.

Gold Run, as the name implies, was settled during the historical gold rush days of California, while Airport, equally descriptive of modern times, was established by the Airways Division of the U. S. Department of Commerce as an emergency landing field for airplanes flying between Sacramento and Reno—one of the most dangerous air routes in the country on account of the heavily timbered, precipitous, and lofty Sierra Mountain range that is crossed.

NARROW AND STEEP

The road to be replaced is typical of mountain wagon roads. The tortuous alignment, narrow width, and steep grades have been improved to some extent by State maintenance forces, but the present road is still far short of the needs for present day volume and speed of traffic.

As evidence of the betterment which will be obtained for traffic, a comparison between the two routes reveals the following:

	Length miles	Width feet	Per cent maxi- mum grade	Minimum curve f. t.
Present road-----	12.971	16	12±	50±
Proposed road-----	11.483	30	6	500

Furthermore, two crossings of the main lines of the Sacramento-Reno division of the Southern Pacific Railroad and one crossing of a branch line—all at grade—will be eliminated by the new construction. The revised location involves, however, near

Towle, one interception of the railroad and highway, distant one-third from the beginning of the project, at which location the highway will be underpassed through a new concrete structure now being speeded to completion.

The new construction, on the basis of the contract bid, will cost per mile, \$22,000 for grading, \$10,000 for miscellaneous structures and \$3,000 for surfacing, or an aggregate cost of \$35,000 a mile for the entire project.

TWO HUNDRED MEN EMPLOYED

The contractor, employing five power shovels and complementary equipment of tractors, scrapers, and dump trucks, and a labor force of nearly 200 men, is moving the earthwork at the rate of 7000 cubic yards daily from designated cuts to fills, in some cases hauling the material one-half a mile to placement. Several cuts and fills of 80 to 100 feet in depth, are being made so that finished construction of line and grade will be commensurate with the present day requirement for this class of highway.

An example of the large masses of earthwork to be moved can be gleaned from the fact that one Engineer's Station alone (representing 100 longitudinal feet of highway center line) 1,000,000 cubic feet of earthwork is to be embanked at some locations.

The road between Auburn and Truckee, of which the portion of highway under discussion is part, while to a large extent catering to pleasure traffic bound to and from the Lake Tahoe region and the El Dorado National Forest, yet also is an integral part of a transcontinental vehicular route identified as U. S. Route 40 (the Victory Highway). As such, it will become, in ever increasing importance, the main transportation means for motorized commercial units plying between northern California and points to the East.

NEAR HYDRAULIC DIGGINGS

Except for the first two and a half and the last mile of the project the route traverses, in a northeasterly direction, a canyon through which flows a tributary of the North Fork of the American River, known as Can-

(Continued on page 17)



SPEEDY WORK being done in moving vast quantities of earth on highway relocation near Gold Run hydraulic diggings.



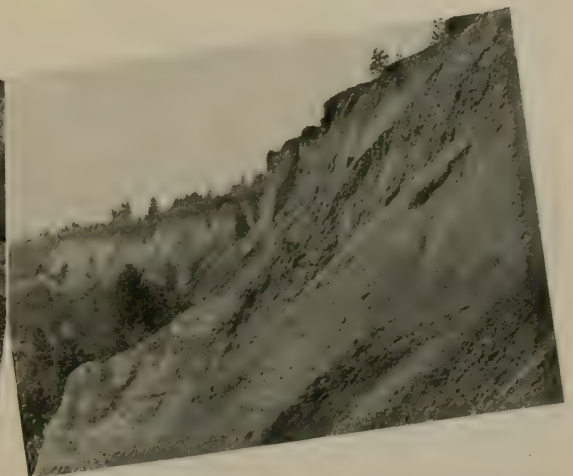
IN TALL TIMBER, this part of new mountain route involves long hauls from cuts to fills.



Sketch Map of Gold Run-Airport Improvement



PIONEERING A ROAD along steep cliffs with steam shovel and trucks. Completed embankment is shown in foreground.



ALONG CENTER LINE before construction near Gold Run. 1,000,000 cubic yards moved in 100 longitudinal feet.

Coachella Valley Dips and Washouts to be Eliminated by Modern Pavement

By E. Q. SULLIVAN, District Engineer

THE reconstruction of fourteen miles of State highway in the Coachella Valley, in Riverside County, on the road to the Imperial Valley sees a pavement of old standard giving way to the demands of modern traffic. The old pavement was built many years ago, 15 feet wide, 4 inches thick, and with shoulders of sand. It has held up well through the years, but pavements laid in the horse and buggy day prove utterly inadequate for modern traffic. The new highway will be 20 feet wide and from 9 to 6 inches thick, with a 12-inch sub-base and hard gravel-shoulders to add to the safety.

Night and day a stream of vehicles follows this highway. Many persons prefer night driving in the desert areas and the truck traffic also starts in the evening from the Imperial Valley gardens for the Los Angeles markets. Great trucks with huge trailers, are used extensively to carry grapefruit, dairy products, hay, watermelons, lettuce, and the endless varieties of garden products, coming into bearing the whole year round. This highway also connects with the Inter-state Borderland Highway at El Centro and therefore also carries a stream of tourists.

ONCE BELOW SEA

To the casual traveler, the route might seem an endless desert waste flanked on the horizon by the shimmering colorful mountains. In reality, the region abounds in



TRAVERTINE ROCK, an Indian profile monolith bearing tribal writings covered with shells, indicating it was once submerged in an ancient sea.



SAND SHOULDERS along the old fifteen-foot highway through Coachella Valley and dip being replaced by modern pavement.

things of interest that astonish the layman and in some instances puzzle the scientist.

As one leaves the green and prosperous Coachella Valley with its multitude of ranches, one passes Travertine Rock. This landmark bears Indian writings, some so old that they are encrusted with shell growths, proving that they have stood beneath the waters of an ancient sea. The beach lines of this ancient sea are plainly marked along the rocky cliffs and sandy slopes. The ancient beach sands are filled with polished shells, and other remnants of sea life, another evidence of geologic changes.

The waters of the present Salton Sea, some 30 miles long and 7 miles wide, gleam to the east a topaz blue, its possibilities as a winter playground hardly touched. Travelers have often compared the Salton Sea to the Sea of Galilee of the Holy Land.

The present Salton Sea was formed during the break in the Colorado River in 1905 to 1907, but geologists generally agree that for a period of probably from 400 years to 500 years, the Colorado River has discharged uninterruptedly into the Gulf of California, except for the brief period in 1905 to 1907. However, there were times in the olden days, confirmed by Indian traditions, when the Colorado River delivered its waters into the Salton Basin for long periods of time instead

Whole Valley Once Great Inland Sea

(Continued from preceding page)

of into the Gulf of California and the whole Coachella Valley was a vast inland sea.



ONLY A CRUST of old pavement was left by a great summer flood of water that crossed this dip.

ANCIENT BEACH LINE

This Salton Basin was then an inland sea with a surface of nearly 2000 square miles, embracing all of what is now known as Imperial and Coachella Valleys. The greatest depth of the sea was about 320 feet. Its margin is the well marked beach line. The present beautiful Salton Sea is but a small portion of what was once this great inland sea.

Fish Springs situated half way between the highway and Salton Sea was once a true oasis with its unfailing water for the pioneer immigrants. The modern autoists turns up his nose at the smell and taste of the alkaline water but pauses to marvel at the flow coming out of the parched ground. A 60-foot plumb bob can not touch the bottom of the flow; tiny pop-eyed fish emerge from the mysterious depths.

The water is clear and limpid; strangely enough, some underground rock barrier divides the underground waters near Travertine Rock in such a way that, just to the north, gush forth from artesian wells waters as sweet as mountain streams, while just to the south in the vicinity of Fish Springs the artesian wells are alkaline.

117 DIPS ELIMINATED

The new highway provides for bridges or culverts to replace all of the 117 rough riding dips of the old highway. This is the land of

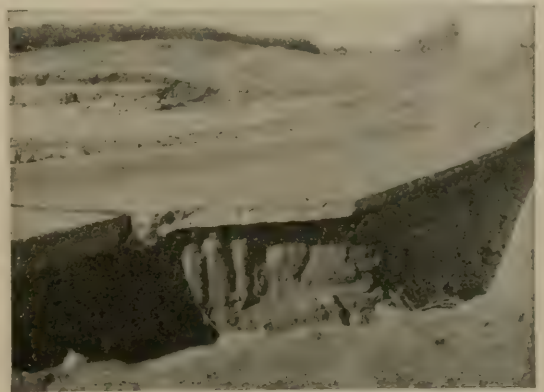
sudden and torrential summer cloudbursts with enormous concentration of precipitation. They happen several times each summer. A cloud rapidly ascending from the horizon within an hour or two sometimes brings torrents of rain which may within a period of fifteen minutes cause floods of water to race down the gullies.

It has not been uncommon for an inexperienced motorist to attempt a crossing and have his car washed from the pavement. In another thirty minutes the brilliant desert sun may be shining again and the land steaming in the summer heat with only a trickle of water in the channels.

Such floods often leave the highway impassable unless it is liberally supplied with bridges and culverts. The accompanying pictures show the result of floods at dips during past summers on the old highway.

Though many people prefer to take summer trips on the desert at night, others taking long trips enjoy driving in the daytime; the dry air and the breeze created by driving keep the traveler reasonably comfortable and he will then have the cooler nights for sleep. The weather on the desert in the winter is usually delightful.

The fascination of the desert increases with each succeeding trip. Moonlight on the desert is of such radiance that mountains and distant views stand out clearly. Perhaps the fascination of the desert lies in its variety. Each trip brings new beauties and experiences.



UNDERMINING of the old thin pavement at dip by flood waters. One hundred seventeen of these dips are to be replaced by culverts.

Eight Road Projects, Nine Bridges on Month's Advertising Program

COLONEL WALTER E. GARRISON, Director of the Department of Public Works, announced that during the month of August, State Highway Engineer C. H. Purcell of the Division of Highways, planned to advertise 13 major projects for construction on State highways at an estimated cost of \$2,224,400.

These projects include eight road jobs and five bridge jobs. The road projects cover work on approximately 56 miles of State highway and amount to an estimated cost of some \$1,564,000. The five proposed bridge projects will involve the construction of nine bridges, estimated to cost approximately \$660,000. The work is distributed well over the State and involves jobs in ten counties.

The following summary and detailed list of projects planned for August advertising show the scope of the proposed work which will carry forward the 1932 State highway construction program:

EXTENDING IMPROVEMENT

In Los Angeles County the second section of construction is to be made on the new Los Angeles-Pomona lateral. A contract has already been awarded and work is about to begin on the easterly portion of the route between Barranca Street and Pomona. The work comprises a graded roadbed 50 feet wide and Portland cement concrete pavement 30 feet wide. At its westerly end this project will connect with the existing concrete pavement on Garvey Avenue at Mountain View Road, and at its easterly end it will connect with the oiled macadam of Arroyo Avenue at Orange Avenue.

Two major structures are planned for construction in connection with this improvement, one, a grade separation with the main line of the S. P. near the beginning of the project, and the other a bridge across the San Gabriel wash. The completion of this new lateral will give to southern California motorists a modern State highway between Los Angeles and Pomona three miles shorter than the present route.

In Fresno County where the Golden State

Highway enters the city of Fresno on the south, it is planned to reconstruct the highway from Fancher Creek to the south city limits of Fresno, a distance of 2.7 miles. This project will carry forward the improvement completed last year on the 7.5 miles between the Fowler Switch Canal and Fancher Creek. The new construction will follow the existing alignment but will provide a heavy 30-foot asphalt concrete pavement on a 46-foot roadbed to replace the existing rough 20-foot concrete pavement.

CURVES ELIMINATED

Major improvement to the Santa Cruz-Stockton lateral in Santa Cruz County is planned for the section of the route in the Santa Cruz Mountains between Inspiration Point and Scott's Valley. The project involves improved alignment and the construction of a 46-foot roadbed.

The existing road has 152 curves with total curvature amounting to more than 20 complete circles, while on the new road there will be only 22 curves, with a total curvature of less than four complete circles. The minimum radius on the existing road is 80 feet and on the proposed alignment 500 feet. There will be a saving in distance of two miles.

This route has become one of the most important recreational highways in the central coast country of California as it connects the Santa Clara Valley and the bay section with the many resorts in the Santa Cruz Mountains and the beaches along the north shore of Monterey Bay. The improvement has become a necessity if adequate facilities are to be provided for the large volume of travel using this highway.

RELIEVES CONGESTION

In Santa Clara County the broad ribbon of the Bayshore Highway is to be carried 8.2 miles further towards San Jose. The new construction will connect with the southeasterly end of the section just completed between Redwood City and Oregon Avenue in Palo Alto and will carry the road by the Sunnyvale Naval Air Base to Lawrence Sta-

(Continued on page 18)

Work Prepared for Bids in August

The following State highway improvement projects with an estimated total cost of approximately \$2,224,000 were planned to be advertised for bids prior to September 1. The road jobs cover approximately fifty-six miles of highway and five bridge projects involving construction of nine bridges. The work is distributed over the State in ten counties as follows:

DETAILED LIST OF PROJECTS

County	Location	Miles	Type of Surface
Los Angeles	Between El Monte and Covina	4.3	Port. Cem. Con. Pave.
Fresno	Fancher Creek to Fresno	2.7	Asphalt Con. Pave.
Tulare	Lemon Cove to Three Rivers	4.5	Bit. Treat Crush. Rock
Santa Clara	Oregon Ave. to Lawrence Sta. Rd.	8.2	Bit. Treat Crush. Rock
Marin	Alto to Belvedere Crossing	3.1	Bit. Treat Crush. Rock
Monterey	San Remo Divide to Carmel River	3.7	Graded Roadbed
Santa Cruz	Inspiration Point to Scott's Valley	4.8	Graded Roadbed
San Bernardino	Westerly Bdry. to San Bernardino and San Bernardino to Anderson St.	24.7	Oiling Shoulders
Los Angeles	Across Piru Creek	----	4 Reinf. Conc. Bridges
Shasta	Across Fall River at Fall River Mills	----	Steel Stringer Bridge
Monterey	Across Wild Cat Creek	----	Reinf. Con. Arch Bridge
Shasta	Across Hat Creek and Pit River	----	2 Steel Stringer Bridges
Kern	Across Kern River at Bakersfield	----	Stl. Str. & Tim. Trestle

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement-----	4.3	\$190,700
Asphalt Concrete Pavement -----	2.7	168,000
Bituminous Treated Crushed Rock Surfacing	15.8	700,700
Graded Roadbed -----	8.5	483,200
Oil Treatment to Shoulders-----	24.7	21,800
Bridges -----	(9)	660,000
Totals -----	56.0	\$2,224,400

20 Dams Under Construction in 1932

(Continued from page 1)

of southern California. This section of the State with a population of two and one-quarter million people, comprises ten per cent of the irrigable area of the entire State and fifty per cent of the State's population. The water resources of southern California are only 1.4 per cent of the total resources of the State and if wholly conserved are insufficient to fully meet future requirements without development of water from other sources. The control and conservation of the surface flow of southern California streams are imperative to meet the ever increasing demands for municipal purposes, irrigation uses and to afford protection against recurring devastating floods.

The urban communities are vitally interested and concerned in being assured of sufficient water to meet their domestic and industrial uses. The rural communities must obtain a sufficient supply, economically developed, to permit of irrigation uses in increasing amounts. Both interests have uppermost in their minds protection against the loss of life and damage to property that has and will continue to result from the recurring torrential floods common to this section of the State.

FOUR COMPLETED

Four major dams have been completed in southern California within the last year, and applications for six have been recently approved and construction is either under way or is expected to start soon. Several are for the dual purpose of flood control and conservation; others are primarily for conservation with small flood control value. The following table lists the larger dams under construction in southern California in 1932

MAJOR DAMS IN SOUTHERN CALIFORNIA UNDER CONSTRUCTION IN 1932

Name	Type	Height foundation to crest of dam	Storage acre-feet	Approximate total cost
Big Tujunga No. 1	Concrete-arch	180	6,250	\$980,000
San Gabriel No. 1	Rockfill	360	68,000	10,000,000
San Gabriel No. 2	Rockfill	270	14,000	3,000,000
Pine Canyon	Concrete-gravity	325	40,000	7,500,000
Bouquet Canyon	Earthfill	215	36,200	4,000,000
Chatsworth enlargement	Earthfill	40	10,500	860,000
El Capitan	Hydraulic fill	240	118,000	4,000,000
Juncal	Concrete-arch	160	7,000	337,000
Santiago	Earthfill	160	25,000	900,000
Irvine	Earthfill	46	17,000	155,000
10 small dams			45,000	172,000
Totals			386,950	31,904,000

The three dams of the Los Angeles County Flood Control District are designed for both flood control and conservation. Big Tujunga No. 1, recently completed under State supervision, is situated on Big Tujunga Creek, above the San Fernando Valley. It is a concrete arch dam of the "variable radius" type in which the radius of the arc increases from lowest point to crest, thereby affecting a saving in amount of materials used and conforming to the contours of the canyon, without sacrificing the safety of the structure. This dam has already been of service in regulating last winter's floods, which otherwise might have caused damage.

Groundbreaking ceremonies were held at the site of the Los Angeles County Flood Control District's San Gabriel No. 2 dam on April 15, 1932, following approval of the plans by the State Engineer and construction is now actively under way. This dam is located on the west fork San Gabriel River, about seven miles upstream from the Forks, and is one of the structures to be built in lieu of the proposed Forks dam on the San Gabriel River.

LARGEST IN WORLD

Plans for San Gabriel No. 1 dam have just been approved. This is the largest dam to be built by the Los Angeles County Flood Control District, and is located in San Gabriel Canyon about two miles below the Forks. It will cost about ten million dollars and be the largest rockfill dam in the world, containing about five million cubic yards of rock. (The largest rockfill dam at present is also in California—the Salt Springs dam of the Pacific Gas and Electric Company.)

San Gabriel Nos. 1 and 2 dams of the Los Angeles County Flood Control District, together with Pine Canyon dam now under construction by the city of Pasadena, will provide for the complete conservation and utilization of the waters of San Gabriel River, and also afford flood protection to San Gabriel Valley.

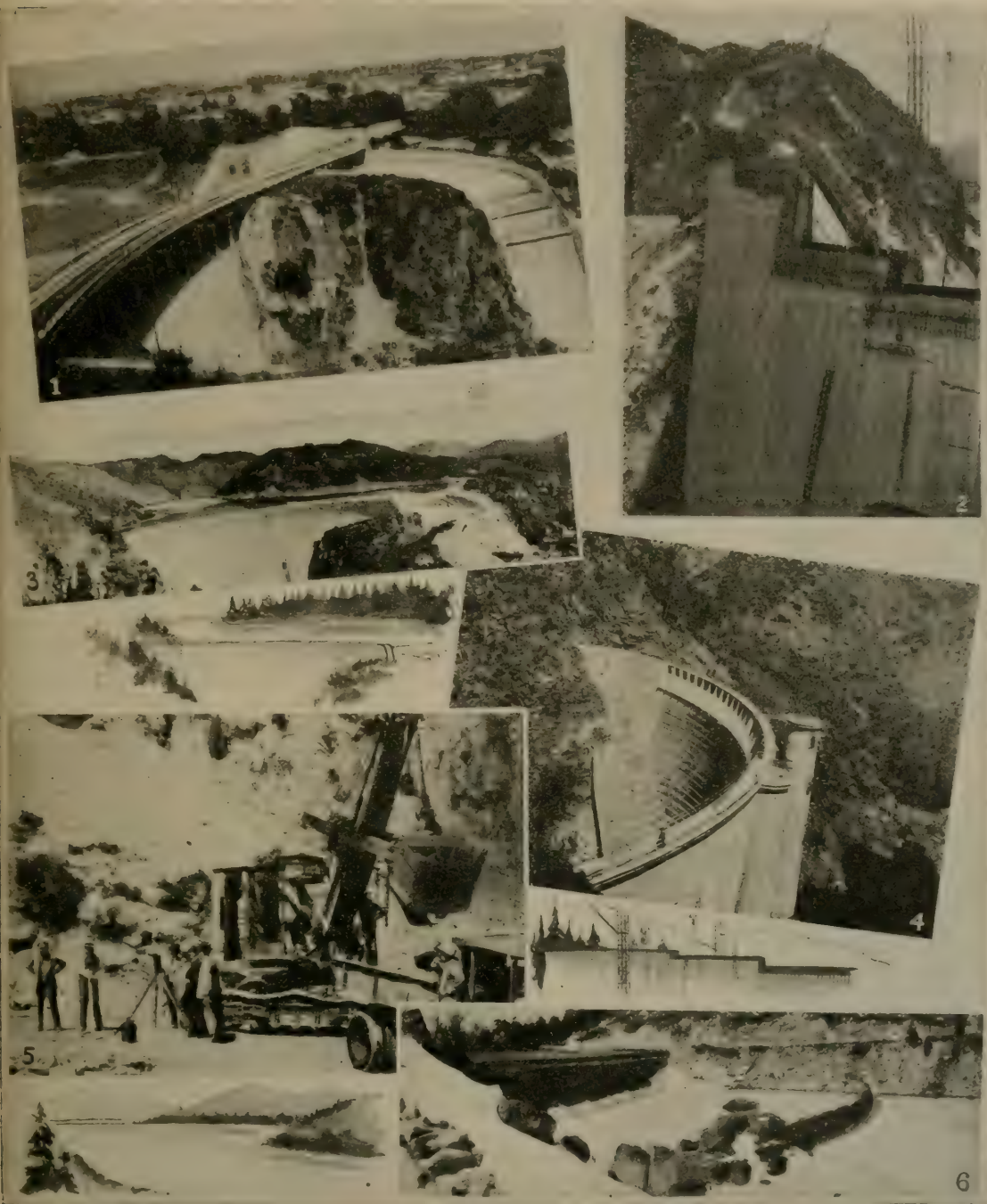
The two dams under construction by the Flood Control District will replace the storage which it was contemplated could be developed by the construction of a masonry dam of unprecedented magnitude at the Forks site on San Gabriel River. When the law governing supervision of dams became effective in

August, 1929, construction had been under way on the Forks dam for about two years, and several million dollars had been spent but a slide had occurred, raising questions as to the safety of the site.

SANCTION REFUSED

An application for approval of the site and plans was made to the State Engineer, who at once initiated a critical examination. Being situated immediately above the populous San Gabriel Valley it was essential that any dam built here should be safe by the best engineering standards. To review the whole situation properly the State Engineer was assisted by

(Continued on page 14)



SOUTHERN CALIFORNIA DAMS will number 170 when the present construction program now under way is completed and the total cost will approximate \$70,000,000, providing a water storage of 1,300,000 acre-feet. Some of the structures already built or building shown in the above group are: No. 1, Devils Gate Dam in the Arroyo Seco near Pasadena; No. 2, Big Tujunga Dam, 180 feet high, a concrete arch type; No. 3, Gibraltar Dam on the Santa Ynez River, built for the city of Santa Barbara water supply system; No. 4, Juncal Dam, built by the Montecito Water District, Santa Barbara County; No. 5, Ground breaking scene at San Gabriel Dam No. 2, being built by the Los Angeles County Flood Control District in San Gabriel Canyon, and No. 6, the original Big Bear Dam, located 150 feet upstream from the site selected for a new dam.

Cajon Pass Realignment Completed Develops a "Magnetic Hill" Curiosity

THE CAJON PASS Highway is now complete and traffic is moving over it. As can be seen by the accompanying illustrations, Cajon Creek has been moved over to the left of the new highway and the highway occupies the old creek channel. One of the heaviest floods in many years descended last winter during the construction of this road. The new channel had been finished and carried the flood safely through with no injury to the new road under construction.

The old road had ninety-one curves which have been reduced to thirty-two on the new highway. The old curves could not safely be negotiated at speeds exceeding thirty miles per hour. Traffic at forty-five miles per hour on the new curves gives a feeling of such safety and security that it is evident should the legal speed limit ever be increased that travel can securely use this road at still higher speed with perfect safety.

COUNTY CAMP MOVED

Camp Cajon lies near the center of this project. It is a campground operated by the county of San Bernardino to welcome tourists coming in from eastern States, and offers a delightful, shady, convenient first night stop in California. The old road was restricted in passing through Camp Cajon by a masonry wall on the one side and rocky cliffs on the other.

Clustered on the rocky cliffs are a number of interesting stone buildings erected by various organizations, and it was impossible to cut back the cliffs without destroying them.

On the other side the ground being level, it was possible to move back the masonry walls and rearrange the monuments, masonry seats, barbecue pits, picnic tables, and other facilities, characteristically inscribed, which have been donated through the years. Care was exercised by the masons and laborers to preserve the original appearance of the masonry in moving back and rebuilding such that no scars are in evidence.

Above Camp Cajon the road branches off to Big Pines, the Los Angeles County Park.

For many years there has been distressing traffic congestion at this junction following heavy snows when pleasure seekers crowded up to the snow sports from the Los Angeles metropolitan area. At this junction when there is snow, vehicles must stop to put on chains. Here two and one-half acres have been leveled to make a large parking space which it is expected will eliminate the congestion.

An unexpected curiosity has developed in the construction of this road. A "magnetic hill" has been discovered. In going north, and passing through the railroad grade separation, the traveler appears to be descending a hill, but if he stops he will find his car will rapidly back up the hill in the most uncanny fashion, suggesting that he is being drawn backwards up hill by some magnetic force. There is actually an ascending grade of one per cent, though the eye is completely deceived and this ascending grade appears to be a descending grade.

The old road, in descending out of the Cajon Pass followed Cajon Wash and was hemmed in by gravel banks. The new highway is up on the mesa and the tourist in entering California will now be greeted by spectacular views of Mount San Jacinto and Mount San Bernardino rising snow capped as a background for the lovely dark green orange groves of California.

ENTER THE COMFORT CONTRACTOR

Exit the heating contractor! Enter the comfort contractor!

The new name for the dual function was introduced at the annual convention of the Heating and Piping Contractors National Association in Detroit. The suggestion was made by a New York consulting engineer.

"As comfort is the slogan of the heating, ventilating and refrigerating manufacturer today, the heating and piping contractor should become a comfort contractor, for by so doing he can embrace in one work all of the things that he is trying to accomplish or sell for all seasons of the year," said the proponent.—*Portland Journal of Commerce*.

An Untaxable Income

Friend: "What's your son's average income?"

Father: "From two to two-thirty a.m."—*Exchange*.



BEFORE MAJOR OPERATIONS by State engineers on the recently completed realignment project, the highway through Cajon Pass, famous transcontinental traffic gateway to southern California, had ninety-one curves, steep grades and the Blue Cut slide, indicated by arrow, that blocked the road with tons of dirt at every rain. One operation involved changing the creek channel to permit moving the road away from the slide.



MINUS 59 CURVES, the Cajon Pass highway is shown after completion of the recent realignment operations. The channel of Cajon Creek has been changed, permitting a new route for the highway sufficiently removed from the hill slopes to prevent further blockades by the Blue Cut slide.

Protection Given 37 Cities and Towns

(Continued from page 10)

a consulting board of outstanding geologists and engineers of national reputation, preeminently qualified to advise upon the safety features.

After thorough consideration the application was disapproved on the grounds that the dam if built would be a menace. The Flood Control District thereupon made intensive studies of other dam and reservoir sites on the San Gabriel River, resulting in the selection of San Gabriel dam sites numbers 1 and 2, plans and specifications for both of which have now been approved.

The city of Pasadena has started construction on its Pine Canyon Dam, located on the main San Gabriel River, about five miles above Azusa and about three miles downstream from San Gabriel No. 1. Groundbreaking ceremonies were held on April 26th last. Plans were approved in June, 1931. This structure will contain about 480,000 cubic yards of concrete and three million pounds of reinforcing steel. The 40,000 acre-feet of storage capacity will make possible the use for domestic consumption in Pasadena of a large amount of water which would otherwise be wasted into the ocean.

Nowhere in the State is there a better example of the necessity for building dams for water conservation, nor of the responsibility devolving upon the State office in approving such dams, than on the San Gabriel River. There will be three great dams on this river, storing a total of 122,000 acre-feet, costing about \$20,500,000.

GREAT VALUES INVOLVED

Downstream lies the San Gabriel Valley, in which are situated 37 cities and towns and a great suburban and agricultural development. The total population of the valley is 750,000, and the assessed valuation \$1,000,000,000, the probable real value being between two and a half and three billion dollars. The dangers inherent in the construction of these dams are apparent. The failure of an upper dam might easily destroy those down stream. In the event of the failure of any one, a catastrophe might be the result.

State supervision of dam building on San Gabriel River has resulted in the abandonment of the proposed Forks dam on the ground that it would have been a menace if built, and in the requirement of increased safety factors on the three dams which are already or soon will be under construction on the river. These actions constitute an assurance to the people of San Gabriel Valley that the water which is absolutely necessary for their use will be made available for them under the consideration that protection of life and property is paramount.

REPLACES DAM THAT FAILED

The city of Los Angeles has started construction of Bouquet Canyon Dam under approved plans. This is located near the upper end of Bouquet Canyon, and will replace the storage capacity which was lost with the failure of the San Francisquito dam. Bouquet Canyon dam will be an earthen structure of very generous proportions, and will be safe by all modern engineering standards. The city has recently com-

pleted the enlargement of Chatsworth Reservoir, which will now store 10,500 acre-feet.

The city of San Diego is building a very large dam of a combination hydraulic fill and rock embankment type, to be known as El Capitan, on the San Diego River. It will supply domestic water for the city of San Diego and also be useful in flood control. The dam is located about twenty-five miles northeast of the city of San Diego.

The Montecito County Water District, adjoining the city of Santa Barbara on the south, completed a few months ago its Juncal dam on the Santa Ynez River, which combines three different types of structures. The main dam across the Santa Ynez River is a variable radius arch, and there is an auxiliary dam in a saddle, one section of which is gravity type and the other multiple arch.

IRRIGATION STORAGE

Several irrigation enterprises have also built large storage dams. A notable example is the recently completed Santiago dam in Orange County, jointly owned by the Carpenter and Serrano Irrigation districts and the Irvine Company. This dam is located on Santiago Creek, about nine miles northeast of the city of Santa Ana, and while intended primarily for irrigation will probably be used for flood control as well.

The application of the Irvine Company of Orange County for the construction of a dam near Newport Bay, which will conserve about 17,000 acre-feet when completed, has been approved.

The investment at this time in the face of present financial difficulties of more than thirty million dollars in these dams for storage of water shows the faith which southern California has in its future, and also demonstrates clearly that water development must go ahead if the State is to progress or even maintain its present position. Continued development of water and water storage under proper regulation is vital.

WIDE FIELD OF DUTY

In addition to supervising construction of new dams, it is the duty of the State Engineer, under the law, to inspect, analyze and report upon all existing dams in the State over the minimum height. While the dams built in earlier years are in general not as large nor of as great technical difficulty as those now contemplated, the problem of obtaining adequate information upon which to approve them as built or upon which to direct repairs, is not easy because in many cases there are no records available to indicate the character of the foundation upon which the dam was built nor the methods or quality of construction.

Under these conditions special investigations or explorations are often necessary to obtain sufficient information upon which to determine what repairs, if any, are necessary.

There are in southern California at the present time or soon will be about 170 dams, with a storage capacity of 1,300,000 acre-feet, which represent a cost of dams alone, exclusive of reservoir lands, water rights, rights of way, appurtenant structures, etc., of about seventy million dollars. The State Engineer exercises supervision over all of these dams, which may be segregated as follows, according to ownership:

170 Dams in South Will Involve Total Cost of \$70,000,000

(Continued from preceding page)

	No.	Acre-feet storage capacity
Municipally owned	49	460,000
Water and flood control districts.....	19	130,000
Irrigation districts	12	50,000
Power companies	3	-----
Individual owners and water com- panies	87	660,000
	170	1,300,000

The city of Los Angeles leads the list as to number of dams, having 27, while the Los Angeles County Flood Control District comes next with 17. The city of San Diego has eight.

SAFETY ASSURED

The number, magnitude and strategic location of these dams in this populous and intensively developed, high-valued section, indicate the necessity of State supervision of these structures in the interest of safety.

This requisite, accentuated by the fact that southern California has within recent years experienced two disasters resulting from dam failures, is the principal reason that the Legislature of the State placed all dams under centralized State authority with power to exercise vigorous supervision from the standpoint of safety and to direct work necessary to render each and all of them safe in conformity with modern engineering knowledge and standards. This function is entrusted to the State Engineer and is one of the most important activities of that office.

The very best cooperation has been received from owners of dams, who in general are favorable both to the law and its administration. It is believed that the dam act has been impartially and competently administered, and it is unequivocally stated that a large number of dams, both new and old, in California are much safer at the present time, or will be when repairs or construction have been completed, than they would have been had the law not been enacted by the Legislature.

This assurance to the people of the State is of much importance in the program of water development which is going on in all parts of California and which must continue in the future if the State is to maintain its present position of leadership.

CALIFORNIA CITY LEADS

The density of motor vehicle registration in Los Angeles is greater than that of any other city in the country, there being 2.4 persons for every motor vehicle registered in the city. This compares with 7.7 persons in New York, 9.2 persons in Chicago, and 11.1 persons in Philadelphia.—*The American City.*

"What is your daughter working for at college—
an M. A.?"

"No, an M-R-S."—*Buffalo Courier-Express.*

HIGHWAY CREW STOPS FOREST FIRE SPREAD

State of California
Division of Forestry

Middletown, July 6, 1932

C. H. Whitmore,
Division Engineer,
Sacramento, Calif.

Dear Mr. Whitmore:

I wish to speak a word of praise in behalf of the following members of the Hi-way crew stationed at the "Clear Lake Oaks," Lake County, Calif.

C. C. McFadden
W. H. Beard
F. H. Holmes

C. E. Hichock
C. Canham
G. F. Baylard

These men were coming home from work when they saw a fire starting from a camp fire that some negligent person had left burning along the road. They immediately proceeded to put a line around the fire and were successful in holding it to a very small area. McFadden then notified me of the fire and I went up there and made an investigation. It pleases me greatly to receive such cooperation from your division. Mr. Beard was with me on a number of fires in the Fair Play district of El Dorado County last year, and I always found him to be a very capable and conscientious man.

Wishing your division the best of success for the future, I remain,

Yours respectfully,

HUGO LINDBLOM,
Asst. Ranger.

ARCHITECTURAL AWARDS For the Month of July

WHITTIER STATE SCHOOL—Steel water storage tanks. Contract awarded to Chicago Bridge and Iron Works, \$6,335.

MENDOCINO STATE HOSPITAL—Drilling and testing water well. Contract awarded to R. L. Norris, Sacramento, \$3,961.

STOCKTON STATE HOSPITAL—Surfacing roads. Contract awarded to C. W. Wood, Stockton, \$5,017.

BORDER STATION AT YERMO—Addition to building. Contract awarded to W. W. Clark, Barstow, \$296.12.

MUST PLAN IN ADVANCE

The tremendous increase in traffic congestion; the efforts of local governments to meet it in the authorization and construction of highways and bridges; the unparalleled rapid extension of urban and suburban conditions into rural areas—all force upon the attention of the citizen, singly and in groups, the fact that advance planning is essential to the proper and economic development of an adequate future highway transportation system.—*The County Highway System.*

Six Cakes of Ice Used to Lower 60-Ton Steel Bridge Span Into Place

By GORDON L. LONG, Resident Bridge Engineer

THE MODERN highway contractor distributes the greater part of his contract monies among a long list of commodities and crafts to which one construction company recently added the wares of the iceman when they made use of six 400-pound cakes of the common or household variety of ice in lowering the sixty-one-ton steel span of the Russian River Bridge on the Tahoe-Ukiah cut-off.

The steel trusses, in three separate pieces, were connected together by transverse floor beams on the approach roadway and moved on rollers over the completed trestle spans to their position above the river channel where they were supported by a temporary pile falsework structure.

Rolling the trusses out over the trestle spans brought them to a position about three and one-half feet higher than their final resting place on the piers.

NO ROOM FOR JACKS

The sections of the trusses were riveted together while supported on the falsework, after which timber cribbing was placed on the concrete piers under the two end floor beams. The falsework was then removed leaving the steel supported at the piers but three and one-half feet above final grade.

The bridge was then lowered with jacks to within six inches of its final height when it was discovered that there would not be sufficient clearance between the bottom of the steel beams and the concrete piers to permit of further use of the jacks.

An order was phoned to the local ice company for the delivery of six 400-pound cakes of ice to the bridge site at 6.30 a.m. the following day.

These ice cakes measured about $10\frac{1}{2}$ inches by 21 inches by 56 inches. Three cakes were placed flatwise on each of the two concrete piers, directly beneath the end floor beams. In order to distribute the load from the relatively narrow bottom flanges of the steel beams over a larger area of the ice, timber planking was placed between the ice and the beams. The jacks were then removed, allowing the entire weight of the span to come onto the ice.

It required twenty-five hours for the ice to melt sufficiently to lower the truss the necessary six inches, but this was no disadvantage as sufficient time was given the workmen to place the steel masonry pedestals and rockers and drive the 5-inch steel pins.

The comparative decrease in the three dimensions of the cakes appeared to be in about direct proportion to the areas of the respective surfaces limiting the dimensions. From this it is deduced that to lower a weight through a much greater distance by this method would demand that attention be given to the decrease in the supporting area of the ice.

Each 400-pound cake of ice supported fifty times its weight, or about twenty thousand pounds. From observation it was roughly estimated that this load could be safely increased by fifty per cent but tests on eight-inch cubes in the Division of Highway's laboratory show that the ultimate compressive strength of the ordinary commercial ice is about 220 pounds per square inch. These tests would indicate that the total safe load, allowing a safety factor of two, permissible on the large surface of one ice cake, would be about 130,000 pounds.

The use of natural ice by builders is not of uncommon occurrence. In the northern latitudes instances of the erection of comparatively heavy bridge spans, supported on the frozen surface of the water during construction, are recorded and in northern Canada, winter construction of a railroad by placing the ballast directly on the frozen swamps and adding more material as the ice thawed in the spring, solved a difficult and otherwise very expensive problem.

In the above instances only a static mechanical property of the ice was utilized and it is believed that the employment of the combined mechanical, physical and thermal qualities of the substance in moving a comparatively large weight as described above.

It might be added that convincing the order clerk at the ice company that he was not on the receiving end of a practical joke was the only difficulty encountered in this novel operation.



A MELTING SCENE—Here's the iceman helping the engineer watch six cakes of ice do the work of jacks in lowering bridge truss.



THE ICEMAN'S BRIDGE over the Russian River on Tahoe-Ukiah cut-off after being properly iced into place.



TRUSSES ON ICE was a new dish for the steel men but they found it did the trick.

GOLD RUN-AIRPORT PROJECT ABOLISHES THREE GRADE CROSSINGS ON U. S. 40

(Continued from page 4)

yon Creek. For the first half of the project the terrain is much more rugged than is the remaining half.

The controls of the route align the new road through a varied topography of bench section on a steep sidehill, where it is projected near the rim of hydraulic diggings at the Gold Run end of the work and on the hillside of the canyon farther along, of moderate cuts and fills where ridges are followed

and of massive cuts and fills where ridges are crossed.

Based on current progress the contractor will finish the construction of this project within the prescribed time limit, having at the present time completed, after slow progress for the first three months of operations, more than one-third of the work, with the time allotment about one-half expended.

"What's happened, George?" she asked her husband, who had got out of the car to investigate.

"Puncture," he said briefly.

"You ought to have been on the lookout for this," was the helpful remark. "You remember the guide warned you there was a fork in the road."—*Tit-Bits*.

13 Major Projects Offered to Bidders on August Schedule

(Continued from page 8)

tion Road. The new section will be a 50-foot roadbed surfaced with bituminous treated crushed gravel or stone 42 feet wide.

This new route down the peninsula from San Francisco has already mitigated the traffic congestion on the Coast Route, although it has only been completed to Palo Alto and its completion into San Jose will provide adequate highway accommodations down the peninsula.

On the new alignment of the Redding-Alturas lateral between Burney and Fall River Mills in Shasta County, bids will be asked for the construction of three bridges. One contract is for a steel stringer bridge across Fall River at the town of Fall River Mills and a second will be awarded for steel stringer bridges across Hat Creek and Pit River.

Road construction on the 19 miles between Canyon Creek, just west of Burney and Fall River Mills is well under way and a contract has recently been awarded for the construction of the westerly ten-mile section.

LARGE BRIDGE PLANNED

As a unit in the construction of a new northerly approach of the Valley Route into Bakersfield, the State plans to construct a new bridge across the Kern River. This major structure will be placed on the new alignment of the State highway to be constructed cooperatively by the State, the city of Bakersfield and Kern County as a revised routing of the Los Angeles-Sacramento arterial through Bakersfield.

The new bridge will be 2295 feet long and will consist of steel stringer spans, timber trestle, and deck of concrete to provide a clear roadway 40 feet wide with two 4-foot sidewalks. This new crossing will eliminate from the State highway the existing narrow concrete arch bridge built 19 years ago by the county.

"How do you determine the horsepower of a car?"

"By the number of horses it takes to haul it back to town."—*National Forest.*

A scientist says a mosquito can fly fourteen hours without alighting. But it seldom does.—*Florence Herald.*

Song of the Bridge

OH WE sing of the clatter and clamor and clang,
As the rising ribs rear high,
Of the breath taking shout of the men far out
Silhouetted against the sky.

And we sing of the churn of the great machine
As it rolls out the mixture below,
Of the swift intake as the columns make
And the bucket swings to and fro.

Oh, high overhead, from yellow and red
The smoke of the donkey turns blue,
With the strain and snap, as the cables slap
And the lines to the sheaves run true.

And we plan for the strength of the structure
As the time stream ebbs and flows
And we plan for the weight of a loading
'Gainst Stress the King of our Foes.

Oh, ye people, who travel the highways
From the uttermost ends of the earth,
To you we sing of this animated thing
That has toiled from the day of its birth.

To the poets and peasants and princes
Who speed cross the rivers and creeks
Hark, to the murmur beneath you!
Hark, while the structure speaks:

"I was born in the vales with primitive man
As he clung to the tree that was home.
I stood with the brave Horatius
By the foam-splashed towers of Rome.

I gave, when the Time was upon me,
As I plunged in the hell-stream's tide,
I gave the all-that-was-in-me,
I gave—but I never died!

I spanned, in the days of Richard,
The moat that guarded the gate,
And armored men with their ladies
Knew that I guarded their fate.

Over the rushing torrents,
Is the place that I pause for rest,
Over the rock-strewn chasm
Is the home that I love the best.

Now rich with years and knowledge,
As the Stream of the World passes by,
I know that I live forever,
I live—and I can not die."

ALFRED C. NORTH,

Assistant Bridge Construction Engineer.

A SAFETY RECORD

Without a single traffic accident death to a child of school age, from 6 to 15 years, in all Los Angeles County during the month, June was the first in 86 months over a period of seven years in which such a record had been scored.

"Official Car" Meets Tragic Fate—Stanton Escapes With Injuries

A tragic fate overtook Commissioner Philip A. Stanton's "official car" on July 9th when it figured in a highway crash that left it a crumpled wreck by the roadside while, to the great joy of his many friends, the veteran California Highway Commissioner escaped with minor injuries.

The "official car" ensemble—Stanton, his ancient flivver, his still more ancient dog and his cigar—a combination, always the same, that has been a familiar sight for years to Orange County folks was proceeding along the Coast Highway near Seal Beach. While turning into Bay Boulevard a speeding machine crashed into them with terrific impact. The "official car" turned several somersaults and came to rest, a crushed, distorted thing minus two legs.

ENSEMBLE EMERGES

Out of the mass of twisted steel and broken glass, Commissioner Stanton emerged bleeding, dragging the unconscious dog Foxie after him and still gripping the cigar between his teeth.

"We thought you were surely killed, Phil," exclaimed a breathless friend who ran to his aid.

"God is in his temple and the government at Sacramento still lives," exclaimed the Commissioner as he calmly took stock of his injuries.

A bad cut on one hand required six stitches, both knees were cut and swollen and numerous contusions were distributed over his body. Foxie was stunned and had a deep cut over one eye. The cigar was mush-roomed.

Commissioner Stanton was taken home and put to bed where he remained for one week with many protests against the doctor's orders. He missed one meeting of the Highway Commission but turned up at the next in Sacramento looking well and fit as ever.

Despite the fact that he is independently wealthy, owns a beautiful estate at Anaheim and an expensive family car which Mrs. Stanton drives, the Commissioner has persistently stuck to his old flivver for his personal use. It was his first love, automotively speaking, and he never learned to drive any other.



Commissioner Stanton in his 'Official Car.'



"Official Car" as it looked after crash.

Highway Builders to Gather in Congress

A joint meeting of more than ten national organizations representing every phase of highway and building activities will be incorporated in the Highway and Building Congress to be held in Detroit during the week of January 16, 1933. It is estimated that this gathering will attract 40,000 people, consisting of highway officials and engineers, contractors, manufacturers, architects, bonding companies, bankers and civic organizations, from all sections of the United States and many foreign countries.

The purpose of the Congress is to devise a coordinated program of future activities that will lead to the immediate improvement in national economic affairs as related to highways and building.

Hungry Tourist—Waiter, two eggs, please. Boil 'em four minutes.

Waiter—Yes, sir, be ready in a second, sir.

WATER RESOURCES

Official Report
As Of

August 1, 1932

EDWARD HYATT, State Engineer

A marked improvement in the agricultural outlook due to better water supply conditions exists throughout the State, according to the report of State Engineer Edward Hyatt, covering the activities of the Division of Water Resources for July. Field inspections covering practically all sections of the State indicate that irrigation enterprises generally are well supplied with water for the current season and that crop yields, particularly in irrigated grain and forage are unusually large. As a result of these conditions, regardless of extremely low prices for farm products, there is a tendency to optimism which did not prevail earlier in the season. Details of dam projects, snow surveys, and river flow investigations are included in the report which follows:

Visits to irrigation districts in the San Joaquin Valley, during the month of July, indicated that crops generally were above the average in yield, and in all cases where irrigation water was obtained from wells a rise in the ground water was reported. In the southern part of the valley this rise was from 5 to 22 feet, and the decreased pumping lift will result in a material saving in power costs. The additional amount of gravity water made available from this season's increased snowfall, will also greatly reduce power costs to those districts which supplement their supply from underground sources.

In the Consolidated Irrigation District, Fresno County, it was estimated that the supply of gravity water this year would save the land owners \$400,000 in pumping costs over those of the previous year. The Alta Irrigation District estimated a saving of \$250,000 and the Fresno district a like amount. Proportionate savings in power costs in the other irrigation districts located in the southern part of the valley would bring the total for the season to approximately \$1,250,000.

DAMS

To date 812 applications have been received for approval of dams built prior to August, 1929; 94 for approval of plans for construction or enlargement and 304 for approval of plans for repair or alteration.

a. *Applications received for approval of plans for repair or alteration.*

Thirty-five of these applications have been received during this period. These applications are largely in response to suggestions from this department which is

endeavoring to have all dams in shape for approval by August 14, 1932; the date set by law for completing investigations of all dams built prior to August 14, 1929.

b. *Plans for the construction of the Cherry Flat Dam on the East Fork of Penetencia Creek in Santa Clara County were approved by the State Engineer this month. This is to be an earthfill dam 50 feet high with a storage capacity of 500 acre-feet. It will be built by the City of San Jose for recreational use.*

c. *Plans for repair or alteration approved.*

Twenty-five such applications have been approved this month.

FLOOD CONTROL AND RECLAMATION

a. *Maintenance of Sacramento flood control project.*

The four small pumping plants for the irrigation of willows along the east levee of the Sutter By-pass are being operated and the planting of additional willows along the west side of the borrow pit has been continued. A small crew has been engaged in cutting star thistles on the east levee, along the entire 21 miles. When this work is completed this levee will be practically free of obnoxious weeds. Thistles have been cut on both levees of the Sacramento By-pass.

The revetment along the south side of the by-pass has been protected by placing a mat of cobbles where the current has a tendency to cut and undermine the concrete protection.

The irrigation dam placed in Butte Slough by a group of farmers, to divert Butte Creek water into the Sutter By-pass, partially failed on July 11th and our equipment and force is being used to make repairs in cooperation with the farmers. Additional sheet piles are being driven, and the structure strengthened and back-filled with rock. It is expected to complete the work by July 25th.

At the present time approximately 1200 goats owned by A. F. Johnston are pasturing in the cut-over land in the lower Sutter By-pass under contract. These goats are performing excellent work in keeping down the young willow growth, and are reducing the maintenance cost considerably.

b. *Sacramento Flood Control Project.*

Reports have been rendered on several applications before the Reclamation Board, and work done under several applications has been inspected.

Two contracts are under way for clearing by-pass and overflow land, the Johnston contract in the lower Sutter By-pass and the Ewell contract in the Feather River bottoms near Marysville.

c. *Russian River jetty.*

Work on the jetty has continued during this period with a crew of 11 men. The track and equipment are in satisfactory condition and rock has been placed in the jetty continuously. A fair percentage of the rock is in pieces of eight tons and larger, which is being placed on the south side. At the present time the material available in the quarry contains approximately 50 per cent waste. A portion of this is being dumped along side the quarry in the ocean, from a side track, the balance being used along the railroad track and a small portion in the jetty for filler. The river channel through the bar has been kept open.

d. *Emergency flood protection and rectification of rivers.*

During this period inspection was made of our bank protection work constructed during the past year on

Snow Run-off Was Well Sustained

(Continued from preceding page)

the Sacramento and San Joaquin River systems. Most of the work is in excellent shape, only minor repairs being needed in certain places, particularly on the paved revetment near the cannery at Isleton.

e. Flood measurements and gages.

Two measurements were made on the San Joaquin River at Mossdale bridge and Vernalis at a low flood stage.

WATER RIGHTS

a. Applications to appropriate.

Thirty-four applications to appropriate water were received during the month of June; 11 were denied and 23 were approved. In the same period 17 permits were revoked or passed for license. The essential data concerning each of the applications received or approved during the month will be found elsewhere in this publication.

Field investigations of completed projects are in progress in San Bernardino, Inyo and Mono counties.

b. Adjudications and water distribution.

Material progress has been made in adjudication and water distribution work in the northern part of the State during the present month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The regular field work comprising the measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, has continued during the past month. In the San Joaquin Valley the snow run-off has been well sustained and it is only within the last few days that the streams have begun to drop rapidly to summer levels. The recorders will be reinstalled and the measurements of return water will be resumed shortly. From June 28th to July 15th the flow of the Sacramento River at Sacramento has dropped from about 11,000 to 4000 second-feet. A continued falling off in the flow may be expected throughout July but no serious irrigation difficulties are anticipated during this season.

Sampling at permanent salinity stations in the Upper Bay and Delta region and operation of the tide gages have been maintained. The following comparison of recent salinity tests with those at the corresponding time in 1931 shows the extent to which the recent stream flow has retarded the seasonal encroachment of salinity. At present its advancement through Suisun Bay has just commenced.

Comparison of Salinity on July 10, 1931 and 1932
Upper Bay and Sacramento-San Joaquin Delta Area

Station—	Salinity in parts of chlorine per 100,000 parts of water	
	July 10, 1931	July 10, 1932
Point Orient -----	1780	1280
Point Davis -----	1660	700
Beulah -----	1390	300
O. and A. Ferry -----	980	14
Collinsville -----	660	1
Antioch -----	510	2
Emmattson -----	470	1
Jersey -----	270	1
Central Landing -----	40	1
Middle River P. O. -----	18	1

CALIFORNIA COOPERATIVE SNOW SURVEYS

Routine field and office work has continued under this project during the past month. Field trips have

been made for the purpose of checking or gathering in equipment and supplies used during the past season, to complete arrangements with various cooperating agencies for the 1933 surveys, and to make some changes and map certain of the snow courses.

Office work has included the computations and maintenance to date of stream flow and precipitation tabulations, etc., and a special study of the modifying effect on April first forecasts of April-July precipitation.

WATER RESOURCES

a. Pit River investigation (Modoc and Lassen counties).

Work on the report covering the three years investigation of the Pit River was continued during the month.

b. Napa Valley investigation.

Stream gagings were made on Rector and Dry creeks during the month of June and field work in connection with the investigation was closed on June 30th. Assembly of the data in preparation for a report is now in progress.

c. Santa Clara investigation.

All streams entering the valley which continued to flow during the month were under observation and the stages noted from time to time. On June 30th Campbell Creek was the only one of the minor streams continuing to flow and this had diminished to approximately 25 gallons per minute at Saratoga.

Computations for the various streams which were gaged during the winter and spring months are now in progress and the data with respect to percolation on the various streams are being assembled. The agreement with Santa Clara Valley Water Conservation District has been renewed looking toward a continuance of this investigation during the fiscal year 1932-1933.

d. South coastal, Ventura, Salinas Valley and Mojave River investigations.

Good progress is being made and work is proceeding along routine lines in the South Coastal Basin, Ventura County, Salinas Valley and Mojave River investigations.

STATE WATER PLAN

At the invitation of Governor Rolph, 250 representatives from all parts of the State gathered at Hotel Oakland, Oakland, on July 11, 1932, to consider the reports of the California Water Resources Commission and the California Joint Legislative Water Committee, and to consider the advisability of calling a special session of the Legislature.

A resolution introduced by John L. McNab of San Francisco and seconded by former Governor Stephens, Assemblyman Robert P. Easley and Thomas M. Carlson recommending that the Governor convene the Legislature in special session to consider the reports of the Joint Legislative Water Committee and the California Water Resources Commission and to propose for adoption a constitutional amendment on the basis suggested in these reports and that the call for such special session be limited to consideration of water legislation was adopted by the assemblage at the close of the meeting.

100 Per Cent Correct

Teacher: "Tommy, is trousers singular or plural?"
Tommy (after much thought): "Singular at the top and plural at the bottom."

Peat Swamp and Big Sand Boils Impeded Work on Cut-off

(Continued from page 2)

at the San Benito River, three miles north of San Juan Bautista. It is 1.4 miles shorter, and rises to an elevation of 473 feet above sea level in comparison to the 1016 foot summit of the old San Juan Grade across the Gabilan Range of mountains.

Although the road passes through seemingly easy country, several unusual engineering problems were encountered. In order to secure the best alignment consistent with modern standards of State highway location, it was necessary to traverse 1.3 miles of heavily watered peat swamps.

Upon removal of the peat, several geyser-like sand boils approximately 50 feet in diameter were encountered under the center of the proposed embankment and pavement; too low to be drained. These unstable areas presented a unique and difficult problem that was overcome only by dumping crushed rock into them until a state of equilibrium was produced, thus portions of the new highway are virtually built upon floating mats of rock.

To preserve the beautiful oaks and odd shaped monoliths at "Pinecate Rocks," it was necessary to construct the pavement over the creek channel. A 10-foot by 8-foot concrete culvert, large enough to drive an automobile through, was built under the pavement for the full length of the channel in the "Gorge." Fourteen acres of this romantically interesting spot was acquired by the State to preclude for all time commercial exploitation and further damage by seekers of treasure supposedly cached somewhere in this area.

During construction 720,000 cubic yards of earth and rock was excavated. Pavement and structures required placing of 47,000 cubic yards of concrete. To provide against a minimum of settlement, all embankments of earth and rock were compacted by watering and rolling in eight inch layers.

The roadbed is constructed to a graded width of 40 feet in cuts and 38 feet on fills. The concrete pavement is 20 feet wide, laid in two 10-foot strips, 7 inches thick in the center and 9 inches on the edges, reinforced along the edges to prevent corner cracking. Oil treated shoulders are constructed on each side of the pavement.

In Memoriam

ERNEST L. P. LEA, aged 61, foreman, connected with District X of the State Division of Highways met his death on June 21, 1932, while in the performance of his duties.

Mr. Lea was spreading rock on a traffic strip north of Lodi in San Joaquin County, being protected by a work car traveling slowly behind him. A heavy truck attempting to pass struck the car, throwing it against Foreman Lea, and injuring him fatally.

Mr. Lea was born in England in 1871, coming to this country when a boy. His first employment on the coast was with a steamship company as boatswain between San Francisco and San Diego. Later he was engaged by a lighterage company that furnished supplies to the "sour doughs" who entered the Nome territory during the spectacular gold rush of that period.

Following his Alaska experience, Mr. Lea was employed by a granite company as derrick man and stone setter during which employment he was engaged upon the setting of stone in the University of California Campanile, the D. O. Mills Bank at Sacramento, the City Hall in Oakland, and other public buildings.

Mr. Lea came to the California Highway Commission in 1921 and was a faithful and conscientious worker during the eleven years of his service. He was a well-known resident of Rio Vista for ten years and a past master of the Rio Vista Lodge of Masons.

Besides his widow, Hattie Lea, he is survived by a daughter, Mrs. Margaret Marshall, of Sacramento, and three sons, Percy V., Ernest E., and Henry V. Lea.

Mr. Lea's son-in-law, Geo. E. Marshall, is a maintenance superintendent connected with District X, with his headquarters at Sacramento.

"It's very hard to drive a bargain nowadays," said the fellow who bought an old flivver for \$10.—*Princeton Tiger*.

Cop—Who was driving when you hit that car?
Drunk (triumphantly)—None of us; we was all in the back seat.

Census Taker: "Would you mind telling me if there is any insanity in your family, lady?"

Young Resident Engineer's Wife: "Well, no, not exactly. Only my husband thinks he's boss here at home."—*South Dakota Highway Magazine*.

Seven timber and concrete bridges, the largest of which is 710 feet long, over the San Benito River, are included in the project.

The total cost of the "Prunedale Cut-Off," including bridges, is approximately \$1,000,000, a cost of \$60,000 per mile.

July Water Applications and Permits

APPLICATIONS FILED

Applications for permit to appropriate water, filed with the State Department of Public Works, Division of Water Resources, During the Month of July, 1932.

MARIPOSA COUNTY—Application 7309. Mutual Mining Company, 1723 Webster Street, Oakland, for 3 cubic feet per second from Whitlock Creek, tributary to Sherlock Creek, thence to Merced River. To be diverted in Sec. 29, T. 4 S., R. 18 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$500.

PLUMAS COUNTY—Application 7310. E. G. Lindsey and Geo. H. Lindsey, c/o Geo. H. Lindsey, Quincy, for 0.25 cubic foot per second from spring tributary to Nelson Creek, thence Middle Fork Feather River. To be diverted in Sec. 15, T. 23 N., R. 10 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$500.

PLACER COUNTY—Application 7311. F. M. Chrisman, 1023 Russ Bldg., San Francisco, for 250 cubic feet per second and 200,000 acre-feet per annum from Middle Fork of American River, tributary to Sacramento River. To be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For power purposes (119,000 h.p. to be developed). Estimated cost \$18,000,000.

PLACER COUNTY—Application 7312. F. M. Chrisman, 1023 Russ Bldg., San Francisco, for 250 cubic feet per second and 200,000 acre-feet per annum from Middle Fork of American River, tributary to Sacramento River. To be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For municipal purposes. Estimated cost \$15,000,000.

SISKIYOU COUNTY—Application 7313. Gearhart Mining Company, c/o Sam Sargent, Happy Camp, Cal., for 3 cubic feet per second from Coon Creek, tributary to South Fork Indian Creek. To be diverted in Sec. 4, T. 17 N., R. 6 E., H. B. and M. For mining purposes.

SIERRA COUNTY—Application 7314. Oregon Creek Company, c/o B. R. Dunwoody, Camptonville, for 50 cubic feet per second from Oregon Creek, tributary to Middle Fork of Yuba River. To be diverted in Sec. 34, T. 19 N., R. 9 E., M. D. B. and M.

EL DORADO COUNTY—Application 7315. B. W. Stone, 161 Ellis St., San Francisco, for 500 cubic feet per second and 125,000 acre-feet per annum from (1) Rubicon River, (2) Pilot Creek, (3) Gerle Creek, (4) Loon Lake, (5) Buck Island Lake, (6) Rock Bound Lake, (7) Little South Fork Rubicon River, tributary to American River Drainage Area. To be diverted in Sec. 9, T. 13 N., R. 16 E., Sec. 11, T. 12 N., R. 12 E., Sec. 24, T. 13 N., R. 13 E., Secs. 11, 31, and 34, T. 14 N., R. 14 E., Sec. 4, T. 13 N., R. 15 E., and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

EL DORADO COUNTY—Application 7316. C. L. Biedenbach, 40 Hillcrest Road, Berkeley, for 200 gallons per day from unnamed stream, tributary to South Fork American River. To be diverted in Sec. 19, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$150.

EL DORADO COUNTY—Application 7317. C. M. Carter, R. D. Nicol and W. P. Austin, c/o C. M. Carter, 2325 Valley St., Oakland, for 614,000 acre-feet per annum from South Fork American River, tributary to American River. To be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For irrigation purposes (450,000 acres). Estimated cost \$9,000,000.

EL DORADO COUNTY—Application 7318. C. M. Carter, R. D. Nicol and W. P. Austin, c/o C. M. Carter, 2325 Valley St., Oakland, for 100,000 acre-feet per annum, from South Fork American River, tributary to American River. To be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For municipal purposes. Estimated cost \$9,000,000.

LOS ANGELES COUNTY—Application 7319. Malcolm R. Savage, c/o Chas. F. Plumber, Architect, W. P. Story Bldg., Los Angeles, for 200 acre-feet per annum from unnamed canyon, tributary to Triunfo Canyon, thence Malibu Creek. To be diverted in Sec. 2, T. 1 S., R. 18 W., S. B. B. and M. For irrigation purposes (100 acres).

ORANGE COUNTY—Application 7320. H. E. Davis, General Delivery, San Juan Capistrano, for 0.025 cubic foot per second from unnamed spring, tributary

to San Juan Creek. To be diverted in Sec. 15, T. 7 S., R. 6 W., S. B. B. and M., for domestic purposes. Estimated cost \$500.

EL DORADO COUNTY—Application 7321. L. E. Finch, 2750 Castro Way, Sacramento, for 200 gallons per day from unnamed stream, tributary to South Fork American River. To be diverted in Sec. 19, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$150.

PLACER COUNTY—Application 7322. Aura Noonchester, c/o Murle C. Shreck, Attorney, Capital National Bank Bldg., Sacramento, for 3 cubic feet per second from McKinney Creek, tributary to Lake Tahoe. To be diverted in Sec. 13, T. 14 N., R. 16 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$1,000.

HUMBOLDT COUNTY—Application 7323. Harry B. Waterman, Willow Creek, for 0.19 cubic foot per second from Friday Creek, tributary to Trinity River. To be diverted in Sec. 28, T. 7 N., R. 5 E., H. B. and M. For irrigation and domestic purposes (15 acres). Estimated cost \$600.

MONTEREY COUNTY—Application 7324. Louise Matter, Box 528, North San Diego, for 0.025 cubic foot per second from unnamed spring, tributary to San Clemente Creek. To be diverted in Sec. 30, T. 17 S., R. 2 E., M. D. B. and M. For domestic purposes.

EL DORADO COUNTY—Application 7325. Kenneth S. Cairns, Oscar O. Reeg and A. W. Blair, c/o Oscar O. Reeg, Box 514, Placerville, for 600 gallons per day from unnamed spring tributary to Echo Lake. To be diverted in Sec. 35, T. 12 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

ALPINE COUNTY—Application 7326. R. Franklin Weber, c/o Sorensens Resort, P. O. Box 10, Gardnerville, Nevada, for 3 cubic feet per second from unnamed stream, tributary to West Carson River. To be diverted in Sec. 1, T. 10 N., R. 18 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$10,000.

ALPINE COUNTY—Application 7327. R. Franklin Weber, c/o Sorensens Resort, P. O. Box 10, Gardnerville, Nevada, for 3 cubic feet per second from unnamed stream tributary to West Carson River. To be diverted in Sec. 1, T. 10 N., R. 18 E., M. D. B. and M. For power and domestic purposes, 51 hp. to be developed. Estimated cost \$10,000.

DEL NORTE COUNTY—Application 7328. A. L. Bailey, Agnes Bailey and W. S. Bailey and John J. Dann and H. A. Schell, O'Brien, Oregon, for 75 cubic feet per second (37.5 cubic feet per second from each of sources 1 and 2) from (1) North Fork Elk Creek and (2) South Fork Elk Creek, tributary to Elk Creek, thence Illinois River. To be diverted in Sec. 12, T. 18 N., R. 4 E., H. B. and M. For mining and domestic purposes. Estimated cost \$12,000.

PLACER COUNTY—Application 7329. George Chapman, Tahoe Vista, for 400 gallons per day from unnamed spring, tributary to Lake Tahoe. To be diverted in Sec. 12, T. 16 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$500.

MENDOCINO COUNTY—Application 7330. Geo. C. Bauer, 1899 Jackson St., Oakland, for 0.15 cubic foot per second from Hazledell Creek, tributary to Robinson Creek, thence Russian River. To be diverted in Sec. 10, T. 14 N., R. 13 W., M. D. B. and M. For irrigation purposes (10.2 acres). Estimated cost \$500.

SISKIYOU COUNTY—Application 7331. George E. Dickson, 1313 S. Florence Avenue, Dunsmuir, for 0.025 cubic foot per second from Yew Creek, tributary to Sacramento River, to be diverted in Sec. 25, T. 39 N., R. 4 W., M. D. B. and M. For irrigation purposes (2 acres). Estimated cost \$100.

SIERRA COUNTY—Application 7332. Taber Development Company, 228 Bank of America Bldg., Stockton, for (1) 15 cubic feet per second and (2) 35 cubic feet per second, total 50 cubic feet per second from (1) Dean's Ravine, (2) South Fork Canyon Creek, tributary to Canyon Creek and Yuba River, to be diverted in (1) Sec. 7, T. 21 N., R. 11 E., (2) Sec. 12, T. 21 N., R. 10 E., M. D. B. and M. For mining purposes.

SISKIYOU COUNTY—Application 7333. William A. Paxton, 955 Edgeware Road, Los Angeles, for 2 cubic

(Continued on page 24)

Water Applications and Permits

(Continued from page 23)

feet per second from Deadwood Creek, tributary to McAdams Creek, to be diverted in Sec. 20, T. 45 N., R. 8 W., M. D. B. and M. For power and domestic purposes. Estimated cost \$100.

PLACER COUNTY—Application 7334. United States, Tahoe National Forest, c/o R. L. P. Bigelow, Supervisor, Nevada City, for 0.1 cubic foot per second from Brockway Tract Springs, tributary to Lake Tahoe, to be diverted in Sec. 12, T. 16 N., R. 17 E., M. D. B. and M. For domestic purposes (80 lots). Estimated cost \$750.

PERMITS ISSUED

Permits to appropriate water, issued by the Department of Public Works, Division of Water Resources, during the month of July, 1932.

INYO COUNTY—Permit 3930, Application 7168. Issued to Ingle Carpenter, suite 820, Detwiler Bldg., Los Angeles, July 6, 1932, for 200 gallons per day from Rock Creek, tributary to Owens River in Sec. 6, T. 6 S., R. 30 E., M. D. B. and M. For use for domestic purposes. Estimated cost \$400.

EL DORADO COUNTY—Permit 3931, Application 7241. Issued to U. S. El Dorado National Forest, Placerville, July 6, 1932, for 1600 gallons per day from Dartmouth Cove Creek, tributary to Upper Echo Lake in Sec. 2, T. 11 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

SUTTER COUNTY—Permit 3932, Application 7085. Issued to Fred H. Heiken, Yuba City, July 9, 1932, for 6.35 cubic feet per second from West Dredger Cut of Sutter By-pass, tributary to Sacramento River in Sec. 11, T. 13 N., R. 2 E., M. D. B. and M. For irrigation of 254.135 acres. Estimated cost \$3,500.

MENDOCINO COUNTY—Permit 3933, Application 7238. Issued to Curtis T. Orwick, Cummings, July 11, 1932, for 0.2 cubic foot per second from Squaw Creek in Sec. 20, T. 23 N., R. 16 W., M. D. B. and M. For domestic and recreational purposes. Estimated cost \$200.

MONO COUNTY—Permit 3934, Application 6913. Issued to A. J. Warrington, Bridgeport, July 18, 1932, for 3 cubic feet per second from Virginia Creek in Sec. 2, T. 3 N., R. 25 E., M. D. B. and M. For placer mining purposes in said Sec. 2. Estimated cost \$50.

MONO COUNTY—Permit 3935, Application 6914. Issued to A. J. Warrington, Bridgeport, July 18, 1932, for 3 cubic feet per second from Dog Creek, in Sec. 16, T. 3 N., R. 25 E., M. D. B. and M. For placer mining purposes in Secs. 11 and 14 of said township. Estimated cost \$1,600.

TEHAMA COUNTY—Permit 3936, Application 7155. Issued to First National Bank Trust Department, c/o W. W. Hoy, agent, Santa Ana, July 20, 1932, for 15-acre-feet per annum from tributary of South Fork of Battle Creek, thence Sacramento River, in Sec. 9, T. 29 N., R. 4 E., M. D. B. and M. For recreational purposes.

MENDOCINO COUNTY—Permit 3937, Application 7249. Issued to Eugene Provost, Dos Rios, July 20, 1932, for 0.025 cubic foot per second from unnamed creek, tributary to Eel River in Sec. 24, T. 22 N., R. 14 W., M. D. B. and M. For recreational and domestic purposes. Estimated cost \$300.

TUOLUMNE COUNTY—Permit 3938, Application 7133. Issued to Russell C. Grigsby, Hotel Terry, Stockton, July 21, 1932, for 0.05 cubic foot per second from Eagle Creek in Sec. 8, T. 3 N., R. 16 E., M. D. B. and M. For recreational and domestic purposes. Estimated cost \$3,000.

MONTEREY COUNTY—Permit 3939, Application 7270. Issued to Division of Highways, Department of Public Works, State of California, Sacramento, July 22, 1932, for 520 gallons per day from Little Soda Springs Creek in Sec. 25, T. 24 S., R. 5 E., M. D. B. and M. For recreational purposes. Estimated cost \$235.

MONTEREY COUNTY—Permit 3940, Application 7271. Issued to Division of Highways, Department of Public Works, State of California, Sacramento, July 22, 1932, for 520 gallons per day from Redwood Creek in Sec. 23, T. 24 S., R. 5 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

MONTEREY COUNTY—Permit 3941, Application 7272. Issued to Division of Highways, Department of

GOOD ROADS AND MOTOR VEHICLES NOW NECESSITIES OF LIFE

Good roads and motor vehicles, the one useless without the other, are both necessities to modern life just as are electric lights and bath tubs.

There was a time when bath tubs and electric lights were luxuries. A decade ago motor vehicles were luxuries; now they are necessities to all.

Consider the school teacher and the mechanic who live in the country and drive many miles to work. Bear in mind the congestion in cities that has been relieved due to the development of automobile transportation permitting people to live comfortably in localities otherwise inaccessible. The motor bus and truck offer new transportation facilities that have added value to real estate in many new localities.

—Georgia Highways.

Public Works, State of California, Sacramento, July 22, 1932, for 520 gallons per day from Spruce Creek in Sec. 4, T. 24 S., R. 5 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

SAN BERNARDINO COUNTY—Permit 3942, Application 7127. Issued to H. C. Zech, 116 E. 31st St., Los Angeles, July 23, 1932, for 0.025 cubic foot per second from unnamed spring in Sec. 31, T. 2 N., R. 2 E., S. B. B. and M. For domestic purposes. Estimated cost \$2,500.

EL DORADO COUNTY—Permit 3943, Application 7077. Issued to (1) R. G. Sproul and (2) S. B. Freeborn, (1) Berkeley, (2) Davis, July 28, 1932, for 400 gallons per day from unnamed stream tributary to Upper Echo Lake, in Sec. 34, T. 12 N., R. 17 E., M. D. B. and M. For domestic purposes.

EL DORADO COUNTY—Permit 3944, Application 6891. Issued to N. L. Apollonio, Camino, July 28, 1932, for 0.025 cubic foot per second from unnamed small creek, tributary to Brush Creek, thence South Fork American River in Sec. 4, T. 10 N., R. 12 E., M. D. B. and M. For domestic purposes. Estimated cost \$400.

MONO COUNTY—Permit 3945, Application 7066. Issued to Cy Williams, Bishop, July 28, 1932, for 200 gallons per day from Rock Creek tributary to Owens River in Sec. 32, T. 4 S., R. 30 E., M. D. B. and M. For domestic purposes.

DEL NORTE COUNTY—Permit 3946, Application 7094. Issued to Hawkins & Brown, Crescent City, July 29, 1932, for 3 cubic feet per second from Diamond Ravine, tributary to North Fork Smith River in Sec. 11, T. 18 N., R. 2 E., H. B. and M. For mining and domestic purposes. Estimated cost \$20.

MONO COUNTY—Permit 3947, Application 7171. Issued to Charles O. Perkins, 1143 Vergue Avenue, Pasadena, July 29, 1932, for 200 gallons per day, from Rock Creek, tributary to Owens River in Sec. 33, T. 4 S., R. 30 E., M. D. B. and M. For domestic purposes. Estimated cost \$25.

SAN FRANCISCO COUNTY—Permit 3948, Application 7181. Issued to Spanish Mining Company and San Francisco Commercial Company, San Francisco, July 29, 1932, for \$1.50 cubic feet per second from Devils Canyon Creek, tributary to Poormans Creek and Yuba River in Sec. 19, T. 18 N., R. 11 E., M. D. B. and M. For mining, milling, including incidental domestic and fire protection. Estimated cost \$6,000.

NEVADA COUNTY—Permit 3949, Application 7182. Issued to Spanish Mining Co., and San Francisco Commercial Company, San Francisco, July 29, 1932, for 3 cubic feet per second from Poormans Creek, tributary to South Fork of Yuba River in Sec. 31, T. 18 N., R. 11 E., M. D. B. and M. For mining and milling, including incidental domestic and fire protection. Estimated cost \$11,000.

Parent—"My son has so many original ideas."

Teacher—"Yes, especially in arithmetic."—*Lustige Blatter.*

Value of Bridge Models Proven



MODELS PAY in ideas for the time and money they cost. That is the verdict of Bridge Department engineers as the result of building this first experimental model of an overhead structure that will carry Culver Boulevard and a railroad over the new Lincoln Boulevard near Playa del Rey.

By **F. W. PANHORST**, Acting Bridge Engineer

THE ABOVE picture is of a model of the proposed Culver Boulevard crossing, built to a scale of one-eighth inch to the foot or one-ninety-sixth of its actual size. The model is about two and one-half feet in length. An artist's sketch of this same crossing was shown in the January issue of this magazine.

On Route 60, the Lincoln Boulevard section of the Roosevelt Highway is being built as a new road crossing Culver Boulevard, a few miles west of Culver City near Los Angeles. At this location Lincoln Boulevard, a six-lane road, will pass underneath Culver Boulevard and the Pacific Electric Railroad. The present Culver Boulevard and the Pacific Electric are now at approximately the same elevation as the new highway. They will be raised and taken over the bridge as shown in the model.

COST IS SMALL

The model is made of plaster of paris and cardboard with a couple of sponges to represent trees. Between \$3 and \$4 worth of material and but a few days of time was necessary to construct this model. Offhand one might say that the Bridge Department was entering into the kindergarten business, but there really is a distinct advantage in making such a model. The reason is to bring out points in appearance not shown on the plans and often hard to discover until the bridge is actually built. Very frequently we see a bridge or building that is an eyesore, which, if a model had first been constructed, would have been built otherwise than planned.

The primary object of a bridge is to carry traffic over a stream, highway or some depression. When a location is in a sparsely populated district and on a tangent where no one will see the side of the bridge or the general appearance of the bridge, economy is paramount. The bridge should be built as cheaply as possible to carry the specified load and no additional cost for appearance sake is justified, but when a bridge is built in such a position that thousands of people daily pass beneath it or alongside of it, a certain amount of consideration should be given to the artistic appearance of the structure.

DEPENDS ON LOCATION

In other words, the amount of time, effort and money spent on the appearance of a bridge should depend entirely on its location, not an equal amount of all given to each structure. Some should be given less and some more.

As an example of this, on bridges across the Los Angeles River in Los Angeles, similar to the Sixth Street Bridge now under construction, thousands of dollars are being spent for appearance sake and this expenditure is justified inasmuch as thousands of people daily pass over, beneath and all around the structure.

As a contrast to the bridges mentioned in Los Angeles, we build some bridges in the desert and in remote mountain sections where the bridge is not seen as a feature of the landscape, in which cases we waste no money on aesthetics but merely build the cheapest bridge to carry the required load, taking into consideration, of course, the life of the structure.

This model is the first made by the department and was made primarily as an experiment to see if the time and effort were justified. We have found that time and money were well spent inasmuch as we have made a number of changes due to certain features appearing in the model which could not be visualized from the plan.

Completely Electrified

An automobile electrical worker was charged with assault and battery, and brought before the judge.

Judge (to prisoner)—What is your name, occupation, and what are you charged with?

Prisoner—My name is Sparks. I am an electrician, and I am charged with battery.

Judge (after recovering his equilibrium)—Officer, put this guy in a dry cell.—*Motor Land*.

Storekeeper: "Shall I draw the chicken for you, madam?"

Young Bride: "No, thank you, your description is quite sufficient."—*Motor Trader*.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 AUGUST, 1932 No. 8

EVERY CENT FOR LABOR

Every dollar that is spent for construction today goes in full amount into labor, and every cent of each dollar that is to be used for construction under the relief bill now in Congress will go into wages, whether of the shirtsleeve or the white-collar worker. This fact needs emphasis not only because many people believe that a large part of the money will leak away in waste, but also because a flood of false assertions on the subject has been spread over the land.

The facts are simple. Roughly, half of the construction dollar goes to labor on the job. Most of the remainder goes to pay for material, tools and fuel, whose cost in turn is due to labor, as the intrinsic value of the ultimate raw materials in the ground is too small to count. The residue goes to pay for supervision, planning, surveys, insurance—all of them again representing wage payments. Profit is non-existent under present day business conditions, for everyone is bidding at or below cost. Even capital investment is disregarded, as is shown by the accounts of numerous corporations, whose plant investment has shown no earnings for months past. The price of steel, for example, is wholly made up of labor wages, in mine or on railroad or at the mill.

Beyond this, however, the same dollar works more than once to create employment, since the wage payments are promptly turned over for food, clothing and shelter, and in this process give new employment to mill hands, store clerks and transportation men, whose wage earnings again put others to work supplying their needs.—*Engineering News-Record.*

Reduced Auto Usage Reflected in State Highway Revenues

MOTORISTS are now paying a huge share of the cost of general government expenses unrelated to roads. The Federal gasoline tax of one cent a gallon is expected to bring in \$130,000,000 from motorists. Federal taxes on motor vehicle sales, accessories and parts, lubricating oil, tires and tubes, will cost motorists another \$100,000,000.

The increased cost of motoring, therefore, is \$230,000,000 a year.

In return the Federal Government is giving the road users \$125,000,000 through Federal Aid for highways. This is \$105,000,000 short of the motorists' contributions to the Federal Government.

Highway authorities in general are of the opinion that the new Federal taxes will reduce the volume of motor usage. This will mean that the highway incomes of many states, particularly those with gasoline tax rates of four, five, six and seven cents a gallon, will suffer reductions in income. The American Automobile Association estimates there will be 1,500,000 fewer cars in use in 1933 than now, largely because of high taxes. There were 730,000 less motor vehicles in 1931 than in 1930.

In the face of reduced income, many highway builders maintain it would be folly for States to use motorists' money for any other purposes than road construction. Roads are inadequate for present traffic demands. Properly built roads lessen travel costs and extend motoring. More money is needed for roads, for economy's sake, not less. It is further claimed: faith must be kept with motorists; that for the best interests of the country, motoring must be stimulated, not thwarted.—*Georgia Highways.*

AN ENORMOUS INVESTMENT

According to the best available information, about two billion dollars' worth of highways were built between 1923 and 1930, and it is reasonable to suppose that these roads are still in existence. The enormous public investment represented by these roads can be very seriously depreciated if highway maintenance is neglected.

About the only tangible thing most of us get out of our taxes is the satisfaction and profit that come from a system of good highways, and it certainly is good governmental, as well as good financial, policy for those in public office to maintain these highways in the best of shape.—*Public Works.*

Vital Statistics on Dam Construction

APPLICATIONS FILED

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of July, 1932.

SAN DIEGO COUNTY—Lily Pond Dam No. 838-2. Cuyamaca Water Company, San Diego, owner; earth, 17½ feet above streambed with a storage capacity of 10 acre-feet. Situated on Alvarado Creek, tributary to San Diego River, in Sec. 16, T. 16 S., R. 1 W., S. B. B. and M.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of July, 1932.

CONTRA COSTA COUNTY—St. Mary's Dam No. 554. St. Mary's College, St. Mary's College, Cal., owner; rolled earth fill, situated on Las Trampas Creek tributary to Walnut Creek, in Sec. 17, T. 1 S., R. 2 W., M. D. B. and M.

CONTRA COSTA COUNTY—Lafayette Dam No. 31-2. East Bay Municipal Utility Corp., Oakland, owner; earth, situated on unnamed creek, tributary to Lafayette Creek, in Sec. 26, T. 1 N., R. 3 W., M. D. B. and M.

PLACER COUNTY—Alta Forebay Dam No. 97-10. Pacific Gas and Electric Company, San Francisco, owner; earth, nine feet above streambed with a storage capacity of 65 acre-feet, situated on no stream, in Sec. 30, T. 16 N., R. 11 E., M. D. B. and M. For regulation purposes for power use. (Removal.)

PLACER COUNTY—Bonnie Nook Dam No. 97-13. Pacific Gas and Electric Company, San Francisco, owner; earth, 18½ feet above streambed with a storage capacity of 11 acre-feet, situated on no stream, in Sec. 36, T. 16 N., R. 10 E., M. D. B. and M. For regulation purposes for water supply use. (Removal.)

MODOC COUNTY—Spicer Dam No. 146-3. Modoc Meat Company, Alturas, owner; buttress and flashboards, situated on Pit River, tributary to Sacramento River, in Sec. 9, T. 42 N., R. 10 E., M. D. B. and M.

LASSEN COUNTY—Watson Dam No. 160-2. Peter Gerig, et al., Bieber, owner; lumber, earth and rock dam, situated on Pit River, tributary to Sacramento River, in T. 38 N., R. 7 E., M. D. B. and M.

RIVERSIDE COUNTY—Hole Dam No. 813. W. J. Hole, Arlington, owner; earth, situated on Arroyo tributary to Santa Ana River, in Sec. 36, T. 2 S., R. 6 W., S. B. B. and M.

LASSEN COUNTY—Laxalt Dam No. 248. Peter Laxalt, Madeline, owner; earth, situated on McDonald Creek, tributary to Madeline Plains, in Sec. 3, T. 36 N., R. 13 E., M. D. B. and M.

MODOC COUNTY—Little Juniper Dam No. 136. G. M. and J. E. Clark, Alturas, owner; earth, situated on Little Juniper Gulch, tributary to Pit River, in Sec. 4, T. 40 N., R. 13 E., M. D. B. and M.

SAN DIEGO COUNTY—Corte Madera Dam No. 837. Corte Madera Corporation, San Diego, owner; earth, situated on Corte Madera Valley, tributary to Pine Creek, in Sec. 16, T. 16 S., R. 4 E., S. B. B. and M.

SHASTA COUNTY—False Lake Dam No. 223. O. Merlo, Redding, owner; earth dam, situated on North Fork Jenny Creek, tributary to Sacramento River, in SE¼ of NW¼ and SW¼ of NE¼ Sec. 4, T. 31 N., R. 5 W., M. D. B. and M.

NEVADA COUNTY—Bowman Rockfill Dam No. 61-2. Nevada Irrigation District, Grass Valley, owner; rockfill, situated on Canyon Creek, tributary to South Yuba River, in Sec. 5, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—French Lake Dam No. 61-6. Nevada Irrigation District, Grass Valley, owner; rockfill, situated on Canyon Creek, tributary to South Yuba River, in Sec. 17, T. 18 N., R. 13 E., M. D. B. and M.

PLACER AND NEVADA COUNTIES—Combie Dam No. 61-9. Nevada Irrigation District, Grass Valley, owner; arch, situated on Bear River, tributary to Yuba River, in Sec. 2, T. 13 N., R. 8 E., M. D. B. and M.

NEVADA COUNTY—Sawmill Flat Dam No. 61-10. Nevada Irrigation District, Grass Valley, owner; situated on Canyon Creek, tributary to South Yuba River,

in Sec. 11, T. 18 N., R. 12 E., M. D. B. and M. Rockfill dam.

NEVADA COUNTY—Island Lake Dam No. 61-12. Nevada Irrigation District, Grass Valley, owner; rock and earth, situated on Canyon Creek, tributary to South Yuba River, in Sec. 27, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—Middle Lake Dam No. 61-13. Nevada Irrigation District, Grass Valley, owner; rock and earth, situated on South Fork Canyon Creek, tributary to South Yuba River, in Secs. 22 and 23, T. 18 N., R. 12 E., M. D. B. and M.

SAN BERNARDINO COUNTY—Running Springs Park Dam No. 806. Bank of America N. T. and S. A., San Francisco, owner; gravity, situated on Deep Creek, in Secs. 5 and 6, T. 1 N., R. 2 W., S. B. B. and M.

PLUMAS COUNTY—Butt Valley Dam No. 93. Great Western Power Company, San Francisco, owner; hydraulic fill, situated on Butt Creek, tributary to North Fork Feather River, in Sec. 13, T. 26 N., R. 7 E., M. D. B. and M.

PLUMAS COUNTY—Lake Almanor Dam No. 93-3. Great Western Power Company, San Francisco, owner; hydraulic fill, situated on North Fork Feather River, tributary to Sacramento River, in Sec. 28, T. 27 N., R. 8 E., M. D. B. and M.

PLACER COUNTY—Lake Valley Dam No. 97-32. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on North Fork, tributary to American River, in Sec. 35, T. 17 N., R. 12 E., M. D. B. and M.

MENDOCINO COUNTY—Van Arsdale Dam No. 97-102. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on South Fork, tributary to Eel River, in Sec. 30, T. 18 N., R. 11 W., M. D. B. and M.

LASSEN COUNTY—Wards Lower Dam No. 227-2. B. F. Gibson, Litchfield, owner; earth, situated on unnamed drainage, tributary to Willow Creek, in Sec. 5, T. 29 N., R. 14 E., M. D. B. and M.

MONO COUNTY—Bridgeport Dam No. 70-2. Walker River Irrigation District, Yerington, Nevada, owner; earth, situated on E. Walker River, tributary to Walker River, in Sec. 34, T. 6 N., R. 25 E., M. D. B. and M.

LASSEN COUNTY—Fulcher Dam No. 156-3. G. L. Kramer, Bieber, owner; buttress and flashboards, situated on Pit River, tributary to Sacramento River.

LASSEN COUNTY—Bieber Dam No. 154. Bieber Dam Association, Bieber, owner; buttress and flashboards, situated on Pit River, tributary to Sacramento River.

LAKE COUNTY—Scott Dam No. 97-101. Pacific Gas and Electric Company, San Francisco, owner; concrete gravity, situated on South Fork Eel River, tributary to Eel River, in Sec. 14, T. 18 N., R. 10 W., M. D. B. and M.

SAN MATEO COUNTY—Dianda Dam No. 615. Dante Dianda, Halfmoon Bay, owner; concrete and earth, situated on Denison Creek.

RIVERSIDE COUNTY—Lake Hemet Dam No. 817. Lake Hemet Water Company, owner; arch, situated on South Fork Valley, tributary to San Jacinto River in Sec. 7, T. 6 S., R. 3 E., S. B. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of July, 1932.

SANTA CLARA COUNTY—Cherry Flat Dam No. 24. City of San Jose, San Jose, owner; earth, 50 feet above streambed with a storage capacity of 500 acre-feet, situated on East Fort Penetencia Creek, tributary to Penetencia Creek, in Sec. 21, T. 6 S., R. 2 E., M. D. B. and M. For storage purposes for recreation use.

LOS ANGELES COUNTY—Alta San Rafael Dam No. 780. Alta San Rafael Company, Pasadena, owner; gravity, 11½ feet above streambed with a storage capacity of 13 acre-feet, situated on Arroyo Seco, tributary to Los Angeles River, in lots 18 and 22, tract No. 8001, in Pasadena. For storage purposes for irrigation use.

Plans Approved for Changes in July

(Continued from page 27)

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of July, 1932.

CALAVERAS COUNTY—Ross Dam No. 99-3. Emma Rose and Hobart Estate, San Francisco, owner; arch, situated on San Domingo Creek, tributary to Calaveras River, in Sec. 14, T. 3 N., R. 13 E., M. D. B. and M.

LASSEN COUNTY—Biscar Dam No. 251. Peter Biscar Karlo, owner; earth, situated on Snow Storm Creek tributary to Secret Valley in Sec. 18, T. 31 N. R. 15 E., M. D. B. and M.

MONTEREY COUNTY—Pacific Grove Dam No. 642-3. Central California Water Supply Company, Pacific Grove, owner; earth, located in Punta Pinos Rancho.

FRESNO COUNTY—Meadows Lakes Dam No. 695. Alva E. Snow, Fresno, owner; earth, located in Sec. 11, T. 10 S., R. 23 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 1 dam No. 230. August Anderson and Dodge Bros., Ravendale, owner; earth, situated on Red Rock Creek, tributary to Madeline Plains, in Sec. 22, T. 36 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 2 dam No. 230-2. August Anderson and Dodge Bros., Ravendale, owners, earth, situated on Red Rock Creek in Sec. 3, T. 35 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Red Rock No. 3 dam No. 230-3. August Anderson and Dodge Bros., Ravendale, owners; earth, located in Sec. 4, T. 35 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Meadow Brook Dam No. 229. L. R. Cady and Frank Coffin, Susanville, owners; masonry, situated on Baxter Creek, tributary to Honey Lake, in Sec. 26, T. 29 N., R. 12 E., M. D. B. and M.

CALAVERAS COUNTY—Salt Springs Valley Reservoir No. 496. The California Company, Stockton, owner; rock, situated on Rock Creek, tributary to Littlejohn Creek, in Sec. 16, T. 2 N., R. 11 E., M. D. B. and M.

LOS ANGELES COUNTY—Twin Lakes Park Dam No. 774-2. Twin Lakes Park Company, Los Angeles, owner; gravity, situated on De Los Aliso Canyon, tributary to Brown's Canyon, in T. 2 N., R. 16 W., S. B. B. and M.

MODOC COUNTY—Mud Lake Dam No. 129-5. Thomas Est., C. A. & Iva S. Raker, Alturas, owner; earth and rock, situated on unnamed stream, tributary to North Fork Pit River, in Sec. 20, T. 43 N., R. 13 E., M. D. B. and M.

PLACER COUNTY—Clover Valley Dam No. 97-16. Pacific Gas and Electric Company, San Francisco, owner; earth, situated on Antelope Creek, tributary to Sacramento River, in Sec. 28, T. 12 N., R. 7 E., M. D. B. and M.

AMADOR COUNTY—Henderson Forebay Dam No. 1-11. Preston School of Industry, Waterman, owner; earth, tributary to Sutter Creek, in Sec. 18, T. 6 N., R. 10 E., M. D. B. and M.

SAN BERNARDINO COUNTY—Chino Ranch No. 1 Dam No. 801. Wm. Rowland Estate and Scott Investment Company, Los Angeles, owners; earth, situated on Brea Canyon, tributary to San Gabriel River in Sec. 14, T. 2 S., R. 9 W., S. B. B. and M.

SAN BERNARDINO COUNTY—Chino Ranch No. 2 dam No. 801-2. Wm. Rowland Estate and Scott Investment Company, Los Angeles, owners; earth, situated on Brea Canyon, tributary to San Gabriel River, in Sec. 24, T. 2 S., R. 9 W., S. B. B. and M.

SAN BERNARDINO COUNTY—Chino Ranch No. 3 dam No. 801-3. Wm. Rowland Estate and Scott Investment Company, Los Angeles, owners; multiple arch, situated on Brea Canyon, tributary to San Gabriel River, in Sec. 23, T. 2 S., R. 9 W., S. B. B. and M.

CONTRA COSTA COUNTY—St. Mary's Dam No. 584. St. Mary's College, St. Mary's College, Cal., owner; earth, situated on Las Trampas Creek, tributary to Walnut Creek, in Sec. 17, T. 1 S., R. 2 W., M. D. B. and M.

MODOC COUNTY—Spicer Dam No. 146-3. Modoc Meat Company, Alturas, owner; buttress and flashboards, situated on Pit River, tributary to Sacramento River, in Sec. 9, T. 42 N., R. 10 E., M. D. B. and M.

PLACER COUNTY—Bonnie Nook Dam No. 97-13. Pacific Gas and Electric Company, San Francisco, owner; earth, 18.2 feet above streambed with a storage capacity of 10.8 acre-feet, located in Sec. 36, T. 16 N., R. 10 E., M. D. B. and M.

MODOC COUNTY—Rye Grass Swale Dam No. 150. W. B. Graves, Alturas, owner; earth, situated on Rye Grass Swale, tributary to Pit River, in Sec. 25, T. 41 N., R. 11 E., M. D. B. and M.

LOS ANGELES COUNTY—Sawpit Dam No. 32-12. Los Angeles County Flood Control District, Los Angeles, owner; arch, situated on Sawpit Creek, tributary to San Gabriel River, in Sec. 13, T. 1 N., R. 11 W., S. B. B. and M.

LASSEN COUNTY—Watson Dam No. 160-2. Peter Gerig, et al., Bieber, owner; timber, situated on Pit River, tributary to Sacramento River, in T. 38 N., R. 7 E., M. D. B. and M.

LASSEN COUNTY—Laxalt Dam No. 248. Peter Laxalt, Madeline, owner; earth, situated on McDonald Creek, tributary to Madeline Plains, in Sec. 3, T. 36 N., R. 13 E., M. D. B. and M.

MODOC COUNTY—Little Juniper Dam No. 136. G. M. and J. E. Clark, Alturas, owners; earth, situated on Little Juniper Gulch, tributary to Pit River, in Sec. 4, T. 40 N., R. 13 E., M. D. B. and M.

LASSEN COUNTY—Coon Dam No. 249. W. W. Long, Susanville, owner; earth, situated on Coon Creek, tributary to Horse Lake, in Sec. 22, T. 33 N., R. 13 E., M. D. B. and M.

SHASTA COUNTY—False Lake Dam No. 223. O. Merlo, Redding, owner; earth, situated on North Fork Jenny Creek, tributary to Sacramento River, in SE $\frac{1}{4}$ of NW $\frac{1}{4}$ and SW $\frac{1}{4}$ of NE $\frac{1}{4}$ Sec. 4, T. 31 N., R. 5 W., M. D. B. and M.

LASSEN COUNTY—Branham Flat Dam No. 249-3. W. W. Long, Susanville, owner; earth, situated on tributary to Horse Lake, in Sec. 20, T. 33 N., R. 13 E., M. D. B. and M.

NEVADA COUNTY—Bowman Rockfill Dam No. 61-2. Nevada Irrigation District, Grass Valley, owner; rockfill, situated on Canyon Creek, tributary to South Yuba River, in Sec. 5, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA AND PLACER COUNTIES—Combie Dam No. 61-9. Nevada Irrigation District, Grass Valley, owner; arch, situated on Bear River, tributary to Yuba River, in Sec. 2, T. 13 N., R. 8 E., M. D. B. and M.

NEVADA COUNTY—Sawmill Flat Dam No. 61-10. Nevada Irrigation District, Grass Valley, owner; rockfill, situated on Canyon Creek, tributary to South Yuba River, in Sec. 11, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—Island Lake Dam No. 61-12. Nevada Irrigation District, Grass Valley, owner; rock and earth, situated on South Fork Canyon Creek, tributary to South Yuba, in Sec. 27, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—Middle Lake Dam No. 61-13. Nevada Irrigation District, Grass Valley, owner; rock and earth, situated on South Fork Canyon Creek, tributary to South Yuba, in Sec. 23, T. 18 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Mose Emery Dam No. 331-3. Loftus Blue Lead Mines, Los Angeles, owner; earth, situated on a gulch tributary to Cedar Grove Ravine, in Sec. 12, T. 21 N., R. 9 E., M. D. B. and M.

SAN BERNARDINO COUNTY—Running Springs Park Dam No. 806. Bank of America, San Francisco, owner; concrete gravity, situated on Deep Creek, in Sec. 32, T. 1 N., R. 2 W., S. B. B. and M.

SAN BERNARDINO COUNTY—Arrow Bear Dam No. 807. Arrow Bear Lake Corporation, Los Angeles, owner; earthfill, situated on South Fork Deep Creek, tributary to Deep Creek, in Sec. 34, T. 2 N., R. 2 W., S. B. B. and M.

LASSEN COUNTY—Lower Ward Lake Dam No. 227-2. B. F. Gibson, Litchfield, owner; earth, situated on unnamed drainage, tributary to Willow Creek.

LOS ANGELES COUNTY—Johnston's Lake Dam No. 192. City of Pasadena et al., Pasadena, owners; earthfill, situated on a draw, tributary to Arroyo Seco.

Highway Bids and Awards for July

COLUSA COUNTY—District III, Route 7, at Arbuckle, about 0.25 mile to be graded and surfaced with bituminous treated crushed gravel or stone. Hemstreet & Bell, Marysville, \$6,546.25. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$5,919.70.

LASSEN COUNTY—District II, Route 29. Erection and completion of an addition to the superintendent's cottage at Susanville. T. H. Johanns, San Francisco, \$1,998; Andrew Sirl, Dunsmuir, \$912, irregular. Contract awarded to R. B. McKenzie, Red Bluff, \$1,900.

LOS ANGELES COUNTY—District VII, Route 26, between Barranca St. and Pomona, about 6 miles to be graded and paved with P. C. concrete. M. J. Bevanda, Stockton, \$337,327.50; Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, \$319,342; Gibbons & Reed Co., Burbank, \$357,665; Jahn & Bressi Construction Co., Inc., Los Angeles, \$297,811; Sander Pearson, Santa Monica, \$352,380; Sharp & Fellows Contracting Co., Los Angeles, \$351,845; Hall-Johnson Co. and M. S. Ross, Los Angeles, \$372,742; J. L. McClain, Los Angeles, \$324,178.50; Peninsula Paving Co. and J. P. Holland, Inc., San Francisco, \$302,332.70; Van der Hellen & Pierson, Castaic, \$354,841.50; Clyde W. Wood, Stockton, \$352,985; J. E. Had-dock, Ltd. and Gist & Bell, Pasadena, \$339,391; United Concrete Pipe Corp., Los Angeles, \$348,698; T. M. Morgan Paving Co., Los Angeles, \$314,831.50. Contract awarded to Griffith Company, Los Angeles, \$290,932.80.

MENDOCINO COUNTY—District I, Route 1, construction of a concrete retaining wall in the town of Willits. Mercer-Fraser Co., Eureka, Cal., \$1,635; F. Maurer & Son, Inc., Eureka, Cal., \$1,930; E. B. Bishop, Sacramento, Cal., \$1,572.50; Whited & Whited, Santa Rosa, Cal., \$1,615.40; Chas. Whited, Willits, Cal., \$1,525; H. Sneed, Berkeley, Cal., \$1,563.50; O. A. Lightford, Willits, Cal., \$1,572.50; San Sciarino, San Jose, Cal., \$1,700; R. E. Shaw, Eureka, Cal., \$1,765. Contract awarded to A. T. Howe, Santa Rosa, Cal., \$1,305.

PLACER COUNTY—District III, Route 17, between Wise Power House and Auburn 1.4 miles bit. surface treatment to exist. borders. E. F. Hilliard, Sacramento, \$923. Contract awarded to Fredrickson & Watson Construction Co., Fredrickson Bros., Oakland, \$873.

SAN DIEGO COUNTY—District VII, Route 2, between Rose Canyon and Torrey Pines Reservoir, about 2.1 miles to be paved with A. C. Daley Corporation, San Diego, \$37,115; V. R. Dennis Const. Co., San Diego, \$37,108.50. Contract awarded to Griffith Company, Los Angeles, \$35,638.

SAN DIEGO COUNTY—District VII, Route 2, between Rose Canyon and Sorrento Creek, about 4.4 miles to be paved with P. C. Concrete. Walter Trepte, San Diego, Cal., \$90,264.40; Jahn & Bressi Const. Co., Inc., Los Angeles, Cal., \$95,375.50; Kovacevich & Price, Inc., South Gate, Cal., \$91,568.20; Share & Fellows Contracting Co., Los Angeles, Cal., \$99,826.10; Griffith Co., Los Angeles, Cal., \$87,007.10; R. E. Hazard Const. Co., San Diego, Cal., \$94,462.50; E. Paul Ford, San Diego, Cal., \$93,028; United Conc. Pipe Corp., Los Angeles, Cal., \$94,777. Contract awarded to B. G. Carroll, San Diego, Cal., \$83,899.85.

SAN DIEGO COUNTY—District VII, Route 2, reinforced concrete girder bridge over A. T. & S. F. Railway about two miles south of Del Mar, two 58-foot spans, two 43-foot 4-inch spans, nine 40-foot spans on concrete bents. M. H. Golden, San Diego, \$108,250.50; Jarboe Construction Co., San Diego, \$139,828.50; E. O. Larsen, San Diego, \$108,418; Heuser & Garnett, Glendale, \$143,631; Weymouth Crowell Co., Los Angeles, \$126,135.80; W. E. Kier Construction Co., San Diego, \$125,356.50; Frank Doran, San Diego, \$117,352; Gist & Bell, Arcadia, \$121,393; Sharp & Fellows Contracting Co., Los Angeles, \$116,846; Obert Bros., Los Angeles, \$114,447.50; Bodenhamer Construction Co., Oakland, \$118,020; Fredrickson & Watson Construction Co. and Fredrickson Bros., Oakland, \$126,019. Contract awarded to Byerts & Dunn, Los Angeles, \$107,652.50.

SAN MATEO COUNTY—District IV, Route 68, between Sierra Point and South San Francisco, about 0.6 mile to be paved with concrete. S. M. McGaw, Stockton, \$29,382.25; Eaton & Smith, San Francisco, \$26,638.50; C. W. Wood, Stockton, \$26,817. Contract awarded to Hanrahan Co., San Francisco, \$22,978.50.

SANTA BARBARA COUNTY—District V, Route 22, painting 259 miles traffic stripe at various locations in

District V. B. G. Carroll, San Diego, Cal., \$1,629.11; Essick Machinery Co., Los Angeles, Cal., \$1,383.06. Contract awarded to Edwin Anderson, San Francisco, Cal., \$1,295.

SANTA CLARA COUNTY—District IV, Route 2, planing existing asphalt concrete surface between Morgan Hill and Sargent Overhead about 10.9 miles. Contract awarded to Standard Road Planing Co., San Luis Obispo, \$5,497.60.

SHASTA COUNTY—District II, Route 28, Mt. Shasta Maintenance Station buildings. J. W. Anderson, Mt. Shasta, \$8,390; M. G. Still, Mt. Shasta, \$8,475; L. H. Selvester, Glenburn, \$9,133; Rolla Arbuckle, Anderson, \$8,294; Luial Cosentino, P. O. Box 366, Dunsmuir, \$7,700; R. B. McKenzie, Box 190, Red Bluff, \$9,000; Andrew Sirl, 300 Wood St., Dunsmuir, bid item not filled in; Theodore Johanns, 2020 15th St., San Francisco, \$8,000; Oliver S. Almle, 60 Sussex St., San Francisco, \$8,167; J. P. Brennan, Redding, \$8,711; J. V. Whiteley, Mt. Shasta, \$7,997.40. Contract awarded to Liston Ehorn, Red Bluff, \$7,637.

SHASTA COUNTY—District II, Route 28, between Canyon Creek and Hat Creek Summit, about 10.2 miles to be graded and surfaced with crushed run base and bituminous treated crushed gravel or stone surface, plant mixed. Isbell Construction Co., Carson City, Nevada, \$404,371; S. H. Palmer & J. P. Holland, Inc., San Francisco, \$301,353.50; Meyer Rosenberg, San Francisco, \$259,052.50; The Utah Construction Co., San Francisco, \$329,604.40; Hemstreet & Bell, Marysville, \$333,037.50; Kern & Kibbe, Portland, Oregon, \$305,647.30; C. T. Malcolm and A. Teichert & Son, Inc., Sacramento, \$319,005.75; California Construction Co., San Francisco, \$294,676.20; Hanrahan Company-Young & Son Company, Ltd., Berkeley, \$324,227.50; E. C. Coats, Sacramento, \$282,635; Fredrickson & Watson Construction Co., Fredrickson Bros., Jones & King, Oakland, \$277,748.60. Contract awarded to T. M. Morgan Paving Co., Los Angeles, \$255,248.25.

VENTURA COUNTY—District VII, Route 2, near Ventura, 2 R. C. girder bridges to be constructed and 814 feet of road to be graded and paved with P. C. concrete. Byerts & Dunn, Los Angeles, \$229,122; Mittry Bros. Const. Co., Los Angeles, \$195,901.20; Carl N. Swenson Co., San Jose, \$216,866.95; Sharp & Fellows Contracting Co., Los Angeles, \$220,624.12; Rocca & Caletti, San Rafael, Cal., \$206,266.50; Pacific Bridge Co., San Francisco, \$228,876; Macco Construction Co., Clearwater, \$222,127.50; Clinton Construction Co. of California, San Francisco, \$222,127.50; Mercer-Fraser Co., Eureka, \$242,506.25; Oberg Bros., Los Angeles, \$207,186; M. B. McGowan, Inc., San Francisco, Gist & Bell, Arcadia, \$222,084.50; Herbert M. Baruch Corp., Ltd., Los Angeles, \$199,805.32; Fredrickson & Watson Const. Co., Fredrickson Bros., Oakland, \$209,267.50; The Utah Construction Co., San Francisco, \$222,473.50. Contract awarded to M. B. McGowan, Inc., San Francisco, \$169,247.

SAFETY COUNCIL OFFERS PROGRAM

The need for thorough research, based on a modern, scientific technique, is emphasized in the "balanced program" which the National Safety Council offers as a definite plan for reducing traffic accidents.

"Traffic engineering studies are needed," says the report, "to determine more accurately the relation between accident occurrence and the various features of street and highway design, construction and maintenance—such as widths, grade, curvature, divided roadways, intersection design, surface, guard-rails, illumination, etc."

Also, if we are to reduce accidents, studies must be made of the effect of various driving practices and regulations relating to speed, to methods of turning, parking, signals, signs and safety zones. Experiences of cities should be studied and compared in order to segregate the good and bad methods and thus set up standards.

Studies should also be made of the habits and abilities of drivers who have had accidents.

July Traffic Count Shows General Decrease in State Highway Travel

By T. H. DENNIS, Maintenance Engineer

A COMPARISON of this and last year's annual July traffic count shows an average decrease this year in both Sunday and Monday traffic; the loss averaging 9.4 per cent on Sunday and 8.3 per cent on Monday.

The count taken on July 10th and 11th, between the hours of 6 a.m. and 10 p.m. covered the traffic on all State highway routes, the vehicles being segregated by hourly periods under the following classifications: California automobiles, light trucks, (under 2 tons), heavy trucks, trailers, buses and horse drawn vehicles.

The main north and south routes, carrying 50 per cent of all State highway travel, show the greatest loss for both days there being only one gain recorded on Sunday for Route 23 between Saugus and Mojave.

SMALL GAIN IN SOUTH

Totals for the main laterals also show a corresponding loss, with a slight gain on a few secondary routes.

Several of the interstate connections show a considerable loss with a small gain for some of the southern entrances, particularly Route 31, which is the main outlet from Boulder Dam and an important route into Los Angeles and the Olympic Games. However, Route 27, the Yuma entrance to California, suffered a heavy loss, more than offsetting the gains made in other routes.

Only the recreational routes held their own in the general traffic slump, losing but 0.5 per cent and 0.4 per cent on Sunday and Monday respectively. These routes, however, represent only 15 per cent of the total State travel and do not greatly affect the State average.

Several of these routes, notably the Skyline boulevard, Lake Tahoe roads, All Year road into Yosemite and the Crest route to Big Bear Lake show a substantial gain over 1931, these gains were more than offset by the loss in Route 60, El Rio to Serra. Portions of this route are under construction which affects the traffic to some extent.

Traffic counts were also made on the new secondary roads taken into the State High-

way System in August of 1931. No comparison is possible on these routes as comparable figures for 1931 are not available. However, the July count shows an appreciable gain over similar figures taken in 1929, indicating an increased use of these roads since their inclusion in the State system.

The comparative loss this year for the four major route classifications expressed as a percentage of the 1931 count is as follows:

	Per cent loss		Per cent of total traffic
	Sunday	Monday	
Main north and south routes	12.3	11.0	50
Laterals between inland and coast	10.1	8.7	25
Interstate connections	4.5	0.5	10
Recreational routes	0.5	0.4	15

Gain or loss in traffic volume expressed as a percentage of the July, 1931, count for all State highway routes, is as follows:

Route	Terminal	1932			
		Per cent gain or loss			
		Sunday		Monday	
1.	Sausalito-Oregon Line	Gain	Loss	Gain	Loss
2.	San Francisco-Mexico Line .....	.....	14.7	.....	14.3
3.	Sacramento-Oregon Line .....	.....	14.7	.....	11.1
4.	Sacramento-Los Angeles .....	.....	11.5	.....	12.4
5.	Stockton-Santa Cruz .....	.....	8.6	.....	11.1
6.	Sacramento-Woodland Junction .....	.....	13.8	.....	8.9
7.	Benicia-Tehama Junction .....	.....	4.2	.....	5.4
8.	Ignacio-Cordelia .....	.....	10.7	.....	10.1
9.	San Fernando-San Bernardino .....	.....	16.6	.....	8.3
10.	San Lucas-Sequoia National Park .....	.....	2.3	.....	7.2
11.	Sacramento-Nevada Line, Echo Pass	8.4	.....	13.3	.....
12.	San Diego-El Centro .....	.....	2.4	.....	2.2
13.	Salida-Route 23, Sonora Pass	2.5	.....	5.9	.....
14.	Albany-Martinez .....	.....	7.4	.....	8.8
15.	Ukiah-Emigrant Gap .....	.....	13.1	.....	13.5
16.	Hopland-Lakeport .....	.....	11.1	.....	20.4
17.	Roseville-Nevada City .....	.....	9.0	.....	8.2
18.	Merced-Yosemite National Park	8.3	.....	0.9	.....
19.	Route 9 W. of Claremont-Riverside	14.0	.....	5.9	.....
20.	Redding-Route 1, near Arcata	6.6	.....	.....	3.2
21.	Richvale Wye-Route 29 .....	.....	8.3	11.7	.....
22.	San Juan Bautista-Route 32 .....	.....	4.3	.....	4.3
23.	Saugus-Alpine Junction .....	.....	14.4	.....	17.3
24.	Lodi-Route 23, Ebetts Pass	5.5	.....	.....	6.0
25.	Nevada City-Downieville .....	.....	3.2	7.5	.....
26.	Los Angeles-Mexico Line	3.5	.....	17.3	.....
27.	El Centro-Yuma, Ariz. .....	.....	5.1	.....	0.5
28.	Redding-Nevada Line .....	.....	35.6	.....	19.4
29.	Bluff-Nevada Line .....	.....	9.8	.....	6.2
30.	San Bernardino-Nevada Line, Jean .....	.....	18.4	.....	6.7
31.	Gilroy-Route 4, Califfa	7.9	.....	7.6	.....
32.	Paso Robles-Famosa	0.7	.....	3.0	.....
33.	Twin Cities-Route 23, Carson Pass .....	.....	9.5	.....	4.7
34.	Peanut-Kuntz	45.4	.....	72.0	.....
35.	Auburn-Truckee, Donner Pass .....	.....	6.9	17.9	.....
36.	Meyers-Nevada Line, Truckee River .....	.....	15.0	.....	13.4
37.	Tahoe City-Nevada Line	30.8	.....	43.4	.....
38.	Route 13-Route 23, Tioga Pass	65.3	.....	58.8	.....
39.	General Grant National Park	8.0	.....	18.4	.....
40.	San Bernardino-Big Bear Lake	122.4	.....	373.9	.....
41.	Boulder Creek-Calif. Redwood Park	39.6	.....	21.2	.....
42.	Willows-Route 3, Biggs .....	.....	20.8	.....	21.3
43.	Klamath River Road	0.6	.....	12.3	.....
44.	Orland-Chico .....	.....	18.0	20.0	.....
45.	McDonalds-Navarro B. Road .....	.....	16.5	.....	46.2
46.	Calistoga-Route 15, Stubbs .....	.....	17.4	.....	16.6
47.	Santa Rosa-Schellville .....	.....	12.8	.....	5.2
48.	Alto-Tiburon .....	.....	9.0	.....	17.5
49.	Fairfield-Lodi .....	.....	11.4	.....	14.7
50.	Michigan Bar, Central Base	60.4	.....	16.8	.....
51.	San Francisco-Route 5, Glenwood	37.5	.....	40.7	.....
52.	Carmel-San Luis Obispo .....	.....	18.8	.....	5.9

		1932				July, 1931		July, 1932	
		Per cent gain or loss				Sun.	Mon.	Sun.	Mon.
		Sunday		Monday		Station location		12	13
Route	Terminal	Gain	Loss	Gain	Loss			10	11
57.	Santa Maria-Freeman and Walker Pass		14.6		14.7	Eureka N. at Eureka Slough Brg. to Waverlyville, Jr. Rt. 20	4,464	3,576	3,700
58.	Bakersfield-Arizona Line, Topock	4.6		20.3		S. on 1	3,880	2,650	3,452
59.	Lancaster-Hallows	13.5			11.0	E. on 20	1,611	799	1,340
60.	El Rio-San Juan Capistrano		20.5		18.0	N on 1	2,601	1,899	2,108
61.	La Canada-Mt. Wilson Road		3.7		16.8	Clam Beach, Jr. C. R. to Crannell, S. on 1	2,145	1,452	1,591
63.	Big Pine-Nevada Line, Oasis		56.5		63.2	E. on C. R.	447	311	268
64.	Indio-Arizona Line, Blythe	13.9		127.8		N. on 1	1,206	1,471	1,145
65.	Auburn-Sonora	57.5		57.4		Orlek Jr. C. R. 1 and C. R. to Welthepec, S. on 1	1,121	1,051	912
66.	Mossdale-Manteca		13.9		11.9	E. on C. R.	41	38	75
67.	Route 2-Pajaro River		45.3		16.2	N. on 1	1,150	1,085	868
68.	San Francisco-San Jose Bayshore		7.9		1.8	Klamath, Jr. Rt. 46 to Klamath Glen, S. on 1	906	847	1,301
69.	San Rafael-San Quentin		20.7		20.4	E. on 46	188	147	421
70.	Ukiah-State Hospital, Talmage	6.7			27.3	N. on 1	852	919	1,163
71.	Crescent City-Oregon Line		27.7		27.5				

A comparison of traffic census for July, 1931, and July, 1932, for Sunday and Monday from 6 a.m. to 10 p.m., shows the following figures:

Route I. Sausalito to Oregon Line (District IV)

Station location	July, 1931		July, 1932	
	Sun. 12	Mon. 13	Sun. 10	Mon. 11
Sausalito to Ferry Building	80	92	38	35
Sausalito-Hyde Street Ferry	11,827	5,350	9,669	4,558
Hyde Street-Berkeley	5,095	3,280	3,785	2,477
Alto Jr. at Jr. Rt. 52				
S. on 1	11,748	6,433	9,239	5,028
E. on 52	1,350	811	1,229	669
W. on 52	11,466	6,186	10,702	1,390
N. on 1				6,147
Calif. Park Y Jr. Rt. 69				
S. on 1	13,252	7,606	8,934	5,183
N. on 1	13,520	7,058	11,701	6,767
E. on 69	4,465	2,315	3,527	1,779
San Rafael N. of Cy. at Hill Top Ignacio, Jr. Rt. 1 and S.	12,790	6,103	11,322	6,121
S. on 1	12,909	5,346	11,026	6,121
E. on 8	3,631	1,151	3,149	1,398
N. on 1	8,633	4,230	8,577	4,811
Petaluma S. of City Limits at Maint. Yard	9,683	5,601	7,536	4,042
Petaluma N. of Cy.	9,311	7,016	8,770	6,469
Cotati at Jr. C. R. to Sebastopol				
S. on 1	8,141	1,674	6,508	3,750
W. on C. R.	4,346	1,720	3,083	1,343
N. on 1	3,612	3,188	3,753	2,767
Santa Rosa S. of Cy. at Triangle Service Station	5,706	4,167	5,179	4,084
Santa Rosa N. of Cy. at S. P. R.	6,849	5,256	5,319	4,772
Healdsburg S. of Cy. at N. W. P. R. R.	5,113	3,721	3,726	3,045
Lytton, Jr. C. R. to Calistoga				
S. on 1	3,293	2,780	2,309	1,885
E. on C. R.	993	721	878	680
N. on 1	2,627	2,195	2,039	2,406
Astl	2,514	2,047	2,206	1,633
McDonald at Jr. Rt. 48 to Booneville				
S. on 1	2,203	1,901	1,743	1,360
W. on 48	130	344	313	254
N. on 1	1,791	1,557	1,468	1,124
Hopland at Jr. Rt. 16 to Lakeport				
S. on 1	1,993	1,898	1,954	1,579
E. on 16	722	751	696	676
N. on 1	2,711	2,622	2,448	2,193
Ukiah S. of Cy. Lts. Jr. with Rt. 70				
S. on 1	2,306	2,117	2,098	1,895
E. on 70	992	1,271	1,058	924
N. on 1	2,969	3,090	2,858	2,575
Ukiah N. of Cy. Lts. Jr. Rt. 15 to Colusa				
S. on 1	3,687	2,983	2,346	1,961
E. on 15	1,037	877	862	660
N. on 1	2,345	2,284	1,734	1,480

District I

Willits N. of Cy. at Jr. C. R. to Sherwood				
S. on 1	1,881	1,778	1,484	1,312
W. on C. R.	50	85	59	74
N. on 1	1,837	1,697	1,421	1,249
Mendocino-Hum. Co. Line	1,342	1,300	1,179	976
Garberville Jr. C. R. to Briceland				
S. on 1	2,048	1,913	1,715	1,502
W. on C. R.	377	291	390	303
N. on 1	2,057	1,964	1,883	1,667
Dyerville at Jr. C. R. to South Fork				
S. on 1	2,225	1,720	1,906	1,426
E. on C. R.	340	334	219	256
N. on 1	2,247	1,624	1,870	1,363
W. on C. R.	223	176	230	162
Alton, Jr. C. R. to Red Bluff				
S. on 1	2,749	2,021	2,449	1,642
E. on C. R.	679	383	785	429
N. on 1	2,979	2,170	2,795	1,826
Fernbridge at Jr. C. R. to Ferndale				
S. on 1	3,684	2,509	3,529	2,113
W. on C. R.	1,178	977	1,177	1,007
N. on 1	3,796	2,623	3,592	2,207
Eureka S. of Cy. Lts.	4,676	4,587	4,046	3,184

Station location	July, 1931		July, 1932	
	Sun. 12	Mon. 13	Sun. 10	Mon. 11
Eureka N. at Eureka Slough Brg. to Waverlyville, Jr. Rt. 20	4,464	3,576	3,700	3,001
S. on 1	3,880	2,650	3,452	2,143
E. on 20	1,611	799	1,340	819
N. on 1	2,601	1,899	2,108	1,325
Clam Beach, Jr. C. R. to Crannell, S. on 1	2,145	1,452	1,591	1,015
E. on C. R.	447	311	268	151
N. on 1	1,206	1,471	1,145	947
Orlek Jr. C. R. 1 and C. R. to Welthepec, S. on 1	1,121	1,051	912	851
E. on C. R.	41	38	75	66
N. on 1	1,150	1,085	868	892
Klamath, Jr. Rt. 46 to Klamath Glen, S. on 1	906	847	1,301	1,354
E. on 46	188	147	421	412
N. on 1	852	919	1,163	1,088
Crescent Cy. S. E. of Cy. at Jr. Rd. to Crescent Cy., S. on 1	1,938	1,973		
N. to C. C.	2,534	2,434		
E. on 1	1,755	1,674		
Crescent Cy. N. Jr. Rt. 71, S. on 1			1,617	1,077
N. on 71			841	819
E. on 1			790	868
Houchl Bridge, C. R. to Smith River, S. on 1			830	663
W. on C. R.			166	117
N. on 1			882	650
Patrick Creek	855	826	556	599

Route 2. San Francisco to Mexico "Coast Route." (District IV)

Cohna Jr. C. R. to S. San Fran.				
N. on 2	26,567	10,069	23,510	9,153
E. on C. R.	3,558	2,280	4,052	1,856
S. on 2	23,009	7,789	19,458	7,297
San Bruno Jr. with Bay Shore Rd. to S. San Francisco, S. W. on 2	21,718	8,244	19,146	7,467
N. E. on C. R.	2,641	2,364	2,367	2,224
S. on 2	21,359	10,768	21,514	9,591
San Mateo S. of Cy. at 16th Ave. Redwood City N. of Cy. Lts.	20,960	10,733	17,895	9,964
Palo Alto at Federal Telegraph Station	18,390	9,141	17,355	9,112
Mt. View, at School to Saratoga, Sunnyside, Jr. C. R. to Saratoga, N. on 2	20,162	11,285	14,142	8,612
W. on C. R.			16,941	9,847
S. on 2	11,968	8,311	16,241	11,457
N. on C. R.	5,670	3,091	5,099	2,961
S. on 2	15,155	8,911	10,167	7,389
5 mi. N. of San Jose	13,696	10,901	11,816	9,503
4 mi. N. of San Jose	12,972	11,907	11,103	9,824
San Jose N. of Cy. Lts. at Lumber Yard	22,217	25,064	17,659	19,529
San Jose S. of Cy. Lts.	11,248	9,405	8,965	8,076
5 mi. S. of San Jose	9,174	6,456	6,800	4,916
15 mi. S. of San Jose	8,342	5,377	6,807	4,864
Gilroy N. of Cy. at Jr. with Mt. Madonna Rd. to Watsonville, N. on 2	8,193	6,736	5,970	5,437
W. on C. R.	1,303	982	1,327	924
S. on 2	8,134	6,790	6,176	5,510
Gilroy, 3 mi. south of city	5,672	3,595	3,573	2,622

District V

San Juan Bautista N. of Cy. at Jr. with Rt. 67 Chittenden Rd., N. on 2	5,617	3,775	3,679	2,947
W. on 67	3,811	1,740	2,084	1,458
S. on 2	5,062	3,436	3,792	2,780
San Juan Bautista S. of Cy. at Jr. with Rt. 22 to Hollister, N. on 2	4,061	3,624	3,930	3,140
E. on 22	3,100	2,145	2,095	1,384
S. on 2	4,263	3,081	2,902	2,334
S. Bt.-Mon. Co. Line	4,058	2,875	2,812	2,276
Salinas, 2 mi. N. Jr. Prunedale Cutoff, N. on Mon. 2-A			2,886	2,254
N. on Mon. 2-J Cutoff			1,749	1,432
S. on Mon. 2-A			4,543	3,595
Salinas N. of Cy. Lts.	7,567	6,614	6,172	5,502
Salinas S. of Cy. Lts.	4,922	5,100	4,614	4,859
Gonzales, 3 mi. N. of Town	3,802	3,490	3,179	2,873
E. End of King City Bridge	3,583	3,140	2,819	2,518
San Lucas S. of Cy. at Jr. C. R. 10 Coalings and C. R. to Jolon, N. on 2	2,666	2,252	2,238	1,947
E. on 10	108	108	123	142
W. on C. R.	85	91	114	130
S. on 2	2,602	2,225	2,119	1,885
Paso Robles N. of Cy. Lts.	3,346	2,981	2,425	2,007
Paso Robles S. of Cy. Lts.	4,164	3,539	3,403	2,622
San Luis Obispo N. of Cy. Lts., San Luis Obispo S. of Cy. Lts., at R. R. Xing	3,955	3,147	3,226	2,583
N. of Pismo, Jr. Rt. 2 and Terrace Ave., N. on 2	6,768	4,867	5,161	3,986
W. on C. R.	6,565	4,444	4,010	3,326
S. on 2	2,014	884	1,464	749
Santa Maria N. of Cy. at Jr. R. 57 to Bakersfield, N. on 2	4,599	3,566	3,409	2,904
E. on 57	4,700	3,326	3,646	2,840
S. on 2	283	146	199	135
	4,736	3,371	3,708	2,876

Station location	July, 1931		July, 1932		Station location	July, 1931		July, 1932	
	Sun. 12	Mon. 13	Sun. 10	Mon. 11		Sun. 12	Mon. 13	Sun. 10	Mon. 11
Harrison Sta. Jc. Rt. 2 and C. R. to Lompoc, W. on 2	3,385	2,983	2,680	2,202	Yuba Cy. N. of Cy. at Jc. Rt. 15, S. on 3	3,862	4,388	3,326	3,785
S. on C. R.	430	404	480	314	W. on 15	2,106	2,392	1,818	1,968
E. on 2	2,998	2,696	2,333	2,004	N. on 3	2,364	2,751	2,103	2,387
1 mi. S. of Zaca Jc. Los Olivos Rd.					Gridley Jc. C. R. to Oroville, S. on 3	1,649	1,872	1,628	1,723
N. on 2	2,790	2,351	2,326	1,895	E. on C. R.	1,003	1,136	862	1,001
E. on 80	187	149	208	116	N. on 3	1,856	1,945	1,714	1,678
S. on 2	2,716	2,283	2,271	1,874	Richvale Wye, Jc. Rt. 21 to Oroville, S. on 3	1,286	1,092	1,081	917
Buellton at Intersection with Co. Rds. W. to Lompoc and Easterly					E. on 21	439	384	411	334
N. on 2	3,061	2,601	2,538	2,096	W. on 3	1,166	1,034	1,000	856
E. on C. R.	683	578	601	499	Chico at Jc. C. R. east to De Sabla, S. on 3	3,167	2,832	1,435	1,299
W. on C. R.	587	431	498	367	E. on C. R.	325	419	292	350
S. on 2	3,494	2,826	2,879	2,309	N. on 3	3,343	3,124	1,504	1,494
Las Cruces, Jc. Lompoc Rd., N. on 2			2,613	2,112	Chico N. of Cy. at Jc. C. R. Ea., S. on 3	1,889	1,601	912	890
W. on C. R.			235	91	E. on C. R.	237	139	185	149
S. on 2			2,804	2,195	N. on 3	1,786	1,632	997	940
Gaviota W. of Rd. to Gaviota Sta. Stony Cr. 3 mi. N. of Goleta	3,249	2,633	2,773	2,124	Chico 3 Mi. N. Jc. C. R. to Cana, S. on 3	1,036	899	501	396
Santa Barbara W. of Cy. at Jc. San Marcos Rd., N. on 2	4,612	3,706	4,197	3,099	W. on C. R.	56	73	39	82
N. on 2	5,891	4,833	9,209	4,291	N. on 3	982	827	483	424
On San Marcos Rd.	1,040	582	711	391					
S. on 2	6,502	5,179	9,678	4,461					
Santa Barbara W. of Cy. Lts. on 2	8,205	7,210	10,738	6,515					
Santa Barbara 300 Ft. E. of Cy. Lts.	12,000	9,867	9,605	8,960					
Carpinteria, Jc. Rt. 2 and Casitas Pass Road, W. on 2	8,666	5,724	6,667	5,041					
N. on C. R.	411	468	433	517					
E. on 2	8,559	5,645	6,458	4,675					
District VII					District II				
Ventura W. of Cy. at Bridge	9,494	5,838	7,627	4,984	Butte-Tehama Co. Line Red Bluff Jc. with Rt. 29 to Susanville, S. on 3	1,567	1,274	1,443	1,417
Ventura, E. of Cy., Jc. Telegraph Rd., E. on 2	9,815	7,034	8,047	6,573	E. on 29	976	725	982	753
W. on 2	12,649	9,397	7,622	5,696	N. on 3	1,943	1,813	1,796	1,715
N. on 79	3,074	2,354	2,786	2,197	Cottonwood S. of Town at Tehama Shasta Co. Line	2,084	2,102		
El Rio Intersection, S. on 2	8,697	5,994	7,061	5,370	Redding S. of Cy. at Jc. Rt. 28 to Alturas, S. on 3	2,278	2,527	2,089	2,361
N. to Satcoy	1,637	1,161	1,287	1,035	E. on 28	736	803	810	824
S. on 60	7,277	5,036	6,112	4,950	N. on 3	2,606	2,856	2,712	3,005
E. on 2	4,233	2,893	3,172	2,244	Redding 3 Mi. N. at Jc. with C. R. to Kennett, S. on 3	1,336	1,035		
Ventura-Los Angeles Co. line	4,904	2,267	3,301	2,099	W. on C. R.	34	42		
Calabasas, Jc. Mulholland Dr., E. on 2	6,737	3,295			N. on 3	1,336	1,028		
W. on 2	6,722	3,284			Gibson-Boulder Creek Maint. Yard	1,334	1,021	1,006	814
S. on C. R.	342	202			Dunsmuir 1.5 Mi. S.	2,119	1,578		
W. of Hollywood-Ventura Blvd. at Sepulveda St.	10,319	6,146	10,257	5,750	Dunsmuir N. Cy. Lts. at Br.	3,321	3,247		
L. A. E. at Indiana St.	14,262	14,510	12,348	13,256	Dunsmuir 4 Mi. N. at Mott	2,330	1,628	1,842	1,588
Whittier at Jc. with Hadley St., W. on 2	18,824	13,073	15,669	12,789	Gazelle 1 Mi. N.	1,600	1,281		
N. on Hadley	3,460	3,258	3,362	3,493	N. of Gazelle, Jc. Montague Rd., S. on 3			868	832
E. on 2	14,319	10,599	13,411	10,844	N. on 3			851	767
La Habra E. Cy. Lts. at Jc. Rds. to La Habra and Brea, N. on 2	8,371	4,719	8,034	4,846	N. on C. R.			94	56
W. to La Habra	4,089	3,423	2,511	2,201	Yreka, S. Cy. Lts., Jc. with Rt. 46 S. of Hornbrook, S. on 3	2,153	2,075		
E. to Brea	2,935	2,038	2,752	1,733	W. on 46	1,504	1,286	1,203	1,069
S. on 2	10,393	5,494	8,318	5,378	N. on 3	273	221	255	267
Anahelm N. of Cy. Lts.	14,003	10,483	12,038	9,830	Oregon Line	1,436	1,190	1,187	1,037
N. of Jc. Santa Ana Blvd. and Chapman	17,640	11,287	15,422	11,085					
Santa Ana N. of Cy. Lts. at Jc. C. R. to Orange, N. on 2	5,695	4,118	5,071	3,883					
E. on C. R.	8,250	6,825	8,560	6,915					
S. on 2	6,438	5,313	5,105	4,430					
Tustin W. of Cy.	8,267	6,224	8,280	6,543					
Serra Jc. Rt. 60, N. on 2	4,649	2,309	4,718	2,950					
W. on 60	7,273	3,636	4,730	3,079					
S. on 2	10,138	5,110	7,407	4,502					
Oceanside Nr. S. Cy. Lts.	10,183	5,769	7,975	5,630					
Delmar at S. P. R. R. Xing	8,924	4,931	7,006	4,437					
La Jolla, N. End Rose Canyon, N. on 2			6,840	4,049					
W. to La Jolla			2,217	1,253					
S. on 2			4,629	2,802					
San Ysidro, Jc. N. of Border, N. on 2			4,255	2,011					
N. W. to Nestor			5,415	3,859					
S. on 2			9,583	5,871					
Route 3. Sacramento to Oregon Line (District III)					Route 4. Sacramento to Los Angeles (District X)				
Sacramento N. at Jc. Garden Highway, W. on 3	13,995	14,593	13,753	14,492	Sacramento S. of City Lts.	7,644	7,466	7,104	7,221
N. on Garden Highway	1,051	827	636	638	7 Mi. House at Intersection Florin Rd., N. on 4	4,549	3,936	3,444	4,531
E. on 3	13,148	13,959	13,263	13,798	E. on C. R.	783	653	822	677
Ben All Xing Jc. C. R., W. on 3	7,080	5,237	7,082	5,030	W. on C. R.	91	112	152	172
N. on C. R.	722	502	706	394	S. on 4	4,139	3,605	3,239	4,343
S. on C. R.	1,125	890	1,006	921	Old Elk Grove at Intersection Franklin-Elk Grove Rd., N. on 4	3,747	3,138	3,754	3,031
E. on 3	6,843	4,967	6,714	4,511	E. on C. R.	703	754	665	737
Jc. C. R. to Folsom N. of 12 Mi. House, S. on 3	6,436	4,591	5,892	4,020	W. on C. R.	477	403	531	361
E. on C. R.	755	390	661	464	S. on 4	3,324	2,695	3,267	2,639
N. on 3	5,753	4,221	5,416	3,641	Twin Cities Jc. Rt. 34 to Jackson, N. on 4	3,535	2,679	3,580	2,739
Roseville, S. of Cy. Lts.	6,493	5,348	6,377	4,613	E. on 31	404	355	443	366
Roseville, N. of Cy. Lts.	1,641	1,527	1,551	1,285	S. on 4	3,559	2,730	3,643	2,775
Lincoln, S. of City	1,731	1,619	1,398	1,241	Jc. S. H. and C. R. to Stockton, Forest Lake, N. on 4	3,332	2,558	3,189	2,686
Marysville, S. of Cy. at Jc. Hammonton Rd., S. on 3	1,946	1,826	1,671	1,620	N. on 4	2,670	2,091	2,675	2,318
Hm. Rd.	983	930	771	836	S. W. on C. R.	692	496	651	406
N. on C. R.	781	938	467	461	Lodi Jc. Rt. 24 to San Andreas, N. on 4	3,605	3,334	3,943	3,344
W. on 3	3,251	3,263	2,535	2,620	E. on 21	1,251	1,251	1,450	1,255
					S. on 4	*	*	*	*
					Cherokee Station, S. on 4	3,464	3,061	4,507	3,793
					E. on C. R.	3,465*	3,009*	307	214
					S. on 4	*	*	*	*
					Stockton S. of Cy. Jc. of Mariposa Rd., W. on 4			3,375	2,997
					E. on C. R.			1,070	841
					S. on 4				
					Turner's Sta. Intersection of Rt. 4 and C. R., N. on 4				
					S. on 4				
					W. on C. R.				
					E. on C. R.				
					S. on 4				
					Ripon N. of City	5,170	4,599	4,771	3,996
					Salida Jc. Rt. 13 to Sonora, N. on 4	5,348	4,667	4,097	3,762
					E. on 13	369	552	285	295
					S. on 4	5,547	5,021	4,166	3,772
					Modesto N. of City	7,602	7,312	6,042	5,744

* Under construction.

July, 1931					July, 1932					July, 1931					July, 1932				
Station location		Sun.	Mon.		Sun.	Mon.		Station location		Sun.	Mon.		Sun.	Mon.					
		12	13		10	11				12	13		10	11					
Modesto S. of Cy. Jc. Crowa								N. W. on C. R.		5,054	4,047		410	462					
Landing Rd.								S. E. on C. R.		877	778		725	748					
N. on 4		10,505	10,285		9,260	8,544		Mossdale Jc. Rt. 66 to Manteca,		4,125	2,801		9,430	2,824					
S. on 4		9,666	9,252		7,967	7,601		N. on 5		3,821	2,847		3,288	2,508					
W. on C. R.		3,088	3,513		2,422	2,690		E. on 66		7,837	5,684		6,684	5,210					
Turlock, N. Jc. C. R.,								Tracy, E. of Cy. Jc. C. R. to Banta,											
N. on 4					3,566	3,453		E. on 5					6,148	4,887					
W. on C. R.					1,337	1,322		N. on C. R.					1,383	1,119					
S. on 4					2,735	2,927		W. on 5					5,021	3,915					
Turlock, S. Jc. C. R.,								Tracy W. of Cy. at Jc. C. R. to											
N. on 1					2,190	1,985		Byron,											
E. on C. R.					2,013	1,882		E. on 5		7,713	5,086		6,504	4,573					
S. on 4					3,972	3,723		N. on C. R.		656	544		660	512					
								W. on 5		7,119	4,585		5,747	4,083					
District IV																			
Stanlaus-Mer. Co. Line		3,965	4,109		3,492	3,140		Altamont at R. R. Sta.		7,389	4,646		6,242	4,143					
Atwater N. of Cy.		4,052	3,949		3,627	3,192		Livermore E. of Cy. at Jc. C. R.											
Merced N. of Cy. Lts. at Bridge		5,684	5,433		4,683	4,626		to Livermore,		7,753	5,246		6,936	4,850					
Merced S. Cy. Lts. at Bridge		3,862	4,077		3,963	3,932		E. on 5		3,048	2,079		2,464	1,837					
Merced-Madera Co. Line		2,567	2,331		2,401	2,015		W. on 5		5,024	3,168		4,487	3,039					
California Jc. Rt. 32 to Gilroy,								Santa Rita Inn Jc. C. R. to											
N. on 4		2,748	2,451		2,514	2,229		Pleasanton,											
W. on 32		906	762		812	721		E. on 5		6,549	4,004		5,684	3,781					
S. on 4		3,557	3,061		3,316	2,897		S. on C. R.		743	418		667	494					
Madera N. of City		4,199	3,641		3,915	3,386		W. on 5		6,931	4,112		5,833	3,818					
Madera-Fresno Co. Line		4,235	4,158		3,908	3,351		Dublin Jc. C. R. to Martinez,											
Muscatel		5,530	4,388		4,159	3,582		E. on 5		7,160	4,221		6,406	4,029					
Fresno N. of Cy. W. of S. P. R.								N. on C. R.		2,202	819		1,863	808					
R. Ring at Jc. Olive Ave.,								W. on 5		7,758	4,410		6,991	4,155					
N. on 4		6,441	5,779		5,201	4,870		Dublin Jc. C. R. to Niles,											
E. on Olive		2,429	1,268		8,164	5,762		S. on 5		7,836	4,507		6,703	3,999					
S. on 4		5,726	5,373		2,242	1,523		E. on C. R.		1,543	616		1,325	553					
W. on Olive		2,029	985		3,790	1,549		W. on 5		8,142	4,490		7,318	4,200					
Fresno, S. of Cy. at Jc. Church								Hayward Jc. with Castro Valley											
Ave. on 4		7,861	8,640		7,476	7,598		E. on 5		10,738	5,392		8,719	5,257					
Malaga, S. of R. R. Sta.		6,349	6,511		5,888	5,608		S. W. on C. R.		2,519	1,809		2,006	1,695					
Fowler S. of City		4,439	4,428		4,354	4,158		W. on 5		8,229	3,601		6,713	6,558					
Selma S. of City		3,868	3,583		3,991	3,538		At Alameda Co. Hospital on											
Kingsburg S. of City Nr. Kings								Ala-5-D		9,171	4,113		12,396	5,344					
River Bridge								Hayward, S. of Cy. Lts.		10,668	4,917		9,837	5,204					
Goshen Jc. Rt. 10 to Hanford		3,936	3,192		3,578	2,932		Niles N. at Hotel Belevior.		9,063	3,646		8,158	3,698					
and Visalia,								Niles at Jc. Niles Canyon Road,											
N. on 4		2,994	2,745		3,004	2,723		N. on 5		8,349	4,583		7,541	4,274					
W. on 10		1,235	1,137		1,145	830		E. on C. B.		2,874	1,456		2,201	1,137					
E. on 4		1,698	1,616		1,597	1,396		S. on 5		7,558	4,454		7,182	4,121					
S. on 4		2,812	2,529		2,655	2,339		Niles S. of Cy. at Jc. C. R. to											
Visalia Wye, Jc. Rt. 10 to								Centerville,		7,362	4,266		7,232	4,038					
Visalia,		2,512	2,525		2,254	2,240		W. on C. R.		2,294	1,808		2,202	1,887					
W. on 4		2,126	1,612		1,779	1,486		S. on 5		5,553	2,756		5,593	2,711					
E. on C. R.		4,190	3,933		3,502	3,485		Mission San Jose Jc. C. R. to											
S. on 10								Livermore,		5,168	2,187		4,901	2,062					
Tulare S. of Cy. Lts.,		3,223	3,208		2,951	2,963		E. on C. R.		2,588	1,598		2,329	1,246					
E. on C. R.		310	436		295	425		S. on 5		7,307	3,496		7,156	3,225					
W. on C. R.		3,284	3,039		2,873	2,814		Warm Springs Jc. C. R. to											
S. on 4								Centerville,											
Tipton at Intersection C. R. to								N. on 5		7,380	3,316		6,229	2,592					
Porterville,		2,962	2,642		2,533	2,459		N. W. on C. R.		6,557	2,676		5,190	2,412					
E. on C. R.		278	247		257	205		S. on 5		14,032	5,986		11,411	4,968					
S. on 4		2,929	2,608		2,532	2,442		5 Mi. N. of San Jose		15,069	7,394		13,189	6,550					
Between Earlimart and Delano.		2,940	2,732		2,785	2,717		San Jose N. of Cy. at Jc. with											
Delano Intersection C. R. to								Gish Road,											
Porterville,								N. on 5		10,789	6,503		7,889	4,943					
N. on 4		3,736	3,302		3,253	3,092		W. on C. R.											
E. on C. R.		547	464		373	358		San Jose W. of Cy. at Sanitarium		13,001	11,819		9,962	9,205					
S. on 4		3,363	3,149		3,180	3,030		Los Gatos N. E. of City		6,591	3,221		5,523	2,941					
Famosa Jc. Rt. 33 to Paso								Los Gatos S. W. of City Lts.		12,160	4,639		8,909	3,357					
Robles,		2,903	2,659		2,656	2,585		Santa Clara-Santa Cruz Co. Line		12,200	3,772		7,275	2,338					
N. on 4		576	584		483	515		Santa Cruz N. of City		8,571	3,494		7,054	2,973					
W. on 33		2,906	2,784		2,704	2,651		Route 6. Sacramento to Woodland Junction (District X)											
S. on 4		3,359	3,399		3,035	3,079		W. of Sacramento, W. of Under-		5,356	4,448		5,031	4,602					
Saco at Saco Garage								pass		4,286	3,338		4,091	3,158					
Bakersfield N. of Cy. at Jc. C.								Davis E. of Cy. Underpass											
R. to Oil Center,								Woodland Wye Jc. Rt. 7 W. to											
W. on 4		5,321	6,965		3,926	4,171		Benicia and N. to Woodland,		4,337	5,327		4,114	3,090					
N. on C. R.		4,422	6,068		4,276	4,643		E. on 7		4,348	3,359		4,485	3,160					
S. on 4		4,426	10,049		7,408	8,151		W. on 7		1,976	1,722		1,702	1,505					
Intersection Brundage Lane and								Route 7. Tehama Junction to Benicia (District X)											
Rt. 4,								Benicia, W. on Benicia-Vallejo Rd.					1,152	989					
N. on 4		4,185	4,179		4,194	3,961		Benicia N. of City		749	398		605	304					
W. on B. L.		827	865		812	797		Cordella Jc. Rt. 8 to Napa,											
S. on 4		4,613	4,230		4,202	3,956		S. on 7		407	268		276	212					
Bakersfield 6 Mi. S. at Jc. C. R.								W. on 8		4,752	3,072		3,276	2,491					
to Taft,								E. on 7		4,998	3,294		3,529	2,739					
N. on 4		3,929	3,774		2,989	2,777		West of Cordella, Old Jc. Rts. 7											
W. on C. R.		1,025	696		557	491		and 8,											
S. on 4		3,784	3,488		3,108	2,859		S. on 7		713	432		481	324					
20 Mi. S. of Bakersfield at Jc.								E. on C. R.		596	412		485	389					
Ht. 57, Maricopa Rd.,								N. on 7		452	295		306	215					
N. on 4		2,615	2,139		2,359	2,159		Fairfield E. of City		5,131	3,644		4,465	3,345					
W. on 57		319	247		270	213		Dixon S. of City		4,265	3,121		4,187	3,108					
S. on 4		2,737	2,305		2,576	2,332		Woodland Wye Jc. Rt. 6,											
Lebec N. of Station		3,061	2,409		2,641	2,317		W. on 7		4,348	3,359		4,485	3,160					
								E. on 6		4,337	3,527		4,144	3,090					
								N. on 7		1,976	1,722		1,702	1,505					
Route 4. (District VII)																			
Liebre Mt. Maint. Sta. at								Route 7. (District III)											
Neenach Rd.		2,943	2,387		2,872	2,333		Woodland S. of City		2,329	2,178		2,143	2,035					
Castaic at Jc. Rt. 79 to Ventura,								Woodland N. of City at Browns											
N. on 4		3,648	3,221		3,113	2,410		Corner,		3,041	2,904		2,743	2,593					
W. on 79		2,031	1,343		1,798	1,022		E. on C. R.		314	319		295	284					
S. E. on 4		5,185	4,146		4,434	3,166		W. on C. R.		1,203	1,139		1,165	1,093					
Saugus at Jc. Rt. 23 to Mojare,								N. on 7		1,788	1,723		1,868	1,573					
N. on 4		1,503	1,626		1,088	986													
E. on 23		3,399	2,140		4,714	2,515													
S. on 4		4,217	3,122		5,665	3,357													
Near Newhall at S. end of Sec.																			
LA-4-E		4,603	3,144		5,172	3,018													

Station location	July, 1931		July, 1932		Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.		Sun.	Mon.	Sun.	Mon.
Williams S. of City.....	1,369	1,424	1,325	1,199	N. on C. R.	230	129	172	92
Williams N. of City.....	1,262	1,454	1,138	1,234	E. on 10.	1,288	628	1,175	629
Willows S. of City.....	1,390	1,472	1,498	1,458					
Willows N. of Cy. at Maint. Sta.	1,581	1,840	1,586	1,618					
Orland N. of City.....	1,586	1,606	1,569	1,492					
Route 7. (District II)					Route 11. Sacramento to Nevada Line via Placerville (District III)				
Red Bluff, S. of town at Reed Cr. Br.	1,530	1,587	1,478	1,452	Sacramento E. of Cy. Lts.	5,034	3,365	4,907	3,324
Route 8. Ignacio to Cordelia via Napa (District IV)					Perkins Jr. with C. R. to Plymouth,				
Ignacio, Jr. Rt. 1 and 8.	3,631	1,151	3,149	1,398	W. on 11.	4,896	3,012	4,675	3,072
Petaluma Creek Bridge.....	3,548	1,132	2,967	1,351	S. E. on C. R.	1,436	966	1,507	1,076
Schellville Jr. Rt. 51 to Santa Rosa,					E. on 11.	3,460	2,071	3,214	2,071
S. W. on 8.	3,656	1,281	3,109	1,359	Folsom W. of Cy. Jc. Pratt Rd.,	2,341	1,420	2,259	1,437
N. on 51.	2,314	992	1,664	769	S. W. on 11.	794	423	825	418
N. E. on 8.	2,793	1,122	2,209	1,050	N. E. on 11.	2,011	1,221	1,574	1,122
Jc. C. R. to Vineburg,					Folsom E. of Cy. at High School,				
W. on 8.	4,199	1,772	2,183	960	N. on 11.	1,384	783	1,051	809
N. on C. R.	1,787	793	1,878	853	W. on C. R.	692	400	711	296
E. on 8.	2,498	1,035	3,529	1,857	E. on 11.	1,926	1,063	1,695	909
Napa Wye Jr. 74 to Vallejo,					El Dorado Jr. Rt. 65,				
N. on 8.	6,551	3,144	5,592	3,237	W. on 11.	2,329	1,179	2,307	1,311
S. on 74.	8,260	4,566	7,066	4,230	S. on 65.	330	253	429	417
E. on 8.	4,869	3,291	4,115	3,015	E. on 11.	2,179	1,199	2,352	1,349
District X					Placerville W. of Cy.	3,071	2,200	2,276	1,589
Cordelia Jr. Rt. 7.	4,752	3,072	3,276	2,491	Placerville E. of Cy.	2,488	1,574	2,397	1,549
On American Canyon Rd.			40	28	Headquarters Camp	1,963	866	1,733	777
					Between Riverton and Kyburz,	1,597	623	1,404	636
					Strawberry Jr.	1,411	616	1,269	579
					Alpine Jr., Jet. Rt. 23,				
					W. on 11.	673	387	1,039	578
					S. on 23.	150	100	297	193
					E. on 11.	625	322	1,168	899
					Mays, Jr. Rt. 38,				
					E. on 11.	856	494	1,432	1,042
					Lakeside, State Line.....	1,443	946	1,449	893
					Route 12. San Diego to El Centro (District VII)				
					San Diego E. of City Euclid Ave.	8,213	5,231	8,724	5,159
					at Cajon Ave.	5,814	4,464	7,021	5,132
					El Cajon W. of Cy. Lts.	2,103	1,029	2,257	1,053
					At Sweetwater Bridge.....				
					Descanso, Jr. C. R. to Warners				
					Spr. W. on 12.			1,735	874
					N. on C. R.			287	126
					E. on 12.			1,723	903
					Jacumba at Jc. C. R. El Campo,				
					W. on 12.	1,611	69*	1,403	808
					S. on C. R.	589	1,021*	360	153
					E. on 12.	2,131	1,122	1,683	946
					* Highway traffic detour on Monday.				
					District VIII				
					On Imp-12-B-Dixieland	1,548	1,072	1,229	871
					El Centro W. of Cy. at Jc. Rt. 26 to S. Bd.,				
					W. on 12.	2,937	3,255	3,082	3,880
					N. on 26.	3,342	3,905	3,293	3,896
					E. on Mulberry Lane.	2,701	2,714	2,819	3,774
					S. on 26.	3,949	4,288	3,954	4,165
					Route 13. Salida to Route 23 at Junction (District X)				
					Salida Jr. Rt. 4.	369	552	285	295
					E. of Salida at McHenry's Jc. C. R. to Modesto,				
					W. on 13.	621	947	606	633
					S. on C. R.	2,121	2,262	1,907	1,854
					N. on 13.	2,103	2,230	1,872	1,824
					Oakdale, W. of Cy.	1,615	1,474	1,500	1,504
					Oakdale, E. of Cy.	2,366	1,396	2,071	1,281
					Mountain Pass Jr. Rt. 40 to Yosemite,				
					S. W. on 13.	1,626	743	1,425	721
					S. E. on 40.	400	185	486	359
					N. E. on 13.	1,311	590	1,199	558
					Sonora S. of City.	1,914	1,410	1,714	1,253
					Sonora E. at Sullivan Creek Bridge,				
					E. on C. R.	891	475	508	485
					N. on 13.	480	425	1,156	638
					W. on 13.	1,374	928	1,574	1,097
					Jc. S. H. and C. R. at Pooleys,				
					W. on 13.	890	557	938	538
					E. on 13.	1,116	576	970	506
					S. on C. R.	203	142	116	134
					Strawberry Jr. C. R. to Pine Crest,				
					W. on 13.	528	182	276	99
					E. on 13.	315	140	201	74
					S. E. on C. R.	279	143	189	66
					District IX				
					Jc. Rt. 23.	110	89	104	64
					Route 14. Albany to Martinez (District IV)				
					Albany at County Line.....	26,875	18,426	23,203	15,220
					Jc. C. R. to Richmond, Cutting Blvd.				
					S. on 14.	20,626	12,863	19,279	11,419
					W. on C. R.	6,053	3,946	4,288	2,962
					N. on 14.	15,921	9,607	15,564	8,539
					Jc. Franklin Canyon Rd.,				
					S. on 14.	14,418	6,060	10,257	5,692
					E. on C. R.	3,523	1,458	4,047	1,437
					N. on 14.	3,492	5,011	7,218	4,609
					Crockett, south approach to bridge	6,009	3,559	5,602	2,933
					Carquinez Straits Bridge.....	*6,853	*4,164	*5,077	*3,487
					Crockett 1 Mi. S. at Jc. C. R. to Crockett,				
					S. on 14.	2,428	1,718	2,078	1,534
					W. on C. R.	1,174	1,350	1,161	1,208
					N. on 14.	2,021	1,391	1,687	1,148
					Martinez W. of Cy. Lts.	1,109	683	885	540
					* 24-hour count.				

Route 15. Route 1 Near Calpella to Route 37 Near Cisco.
(District IV)

Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.
Ukiah N. at Jc. Rt. 1.....	1,037	877	862	660
District III				
Upper Lake, S. of Cy. Jc. C. R.				
to Lakeport.....				
W. on 15.....	1,196	1,094	901	795
S. on C. R.....	710	518	512	413
N. on 15, Main St.....	1,371	1,343	1,053	946
Upper Lake, Jc. C. R. to Bartlett Springs.....				
W. on 15.....	584	351	813	486
E. on C. R.....	60	30	61	32
S. on 15.....	610	325	806	497
Lower Lake Jc., Jc. Rt. 49,				
W. on 15.....	895	476	649	371
S. on 49.....	854	340	285	285
E. on 15.....	550	273	403	238
Williams, 5 Mi. W., Jc. Mt. House Rd.,				
W. on 15.....	442	245	239	142
W. on C. R.-Old Rd.....	195	149	52	58
E. on 15.....	375	376	290	177
Williams W. of Cy.....	790	681	852	767
Williams E. of Cy.....	645	617	620	659
Colusa E. of Cy.....	1,000	889	841	804
Sutter City, Jc. C. R.,				
W. on 15.....	925	743	845	642
S. on C. R.....	334	304	309	288
E. on C. R.....	360	402	378	313
S. on 15.....	968	949	855	806
Yuba City, Jc. Rt. 3.....	2,106	2,392	1,818	1,968
Marvillsville E. of Cy.....	1,312	726	1,164	711
Smartsville E., Jc. N. and S. Side Road,				
W. on 15.....	258	158	401	201
W. on side road.....	81	63	69	48
E. on 15.....	225	169	411	195
Grass Valley W. of Cy.....	789	777	1,533	767
Nevada City E. of Cy.....	793	574	1,005	701
Jc. Rt. 15 and Washington Rd.,				
W. on 15.....	125	198	375	205
N. on C. R.....	74	85	111	143
E. on 15.....	225	181	428	249
Emigrant Gap, Jc. Rts. 37 & 15	211	85	276	98

Route 16. Hopland to Lakeport (District IV)

Hopland at Jc. Rt. 1.....	722	751	696	676
Lakeport S. of Town at Jc. C. R. to Kelseyville.....				
N. E. on 16.....	1,200	1,015	1,018	913
S. on C. R.....	976	831	862	792
W. on 16.....	256	267	293	248

Route 17. Roseville to Nevada City (District III)

Noserville E. of C.	4,627	3,088	4,626	2,907
Auburn W. of Cy. Jc. Ophir Rd.,				
W. on 17.	2,362	1,554	2,457	1,500
N. on C. R.	280	224	270	203
E. on 17.	1,967	1,555	2,202	1,525
Auburn N. of Cy. Jc. Country				
Club Rd.,				
E. on 17.	704	440	840	511
E. on C. R.	108	83	166	83
N. on 17.	610	473	795	498
Grass Valley S. of City	1,416	907	1,505	1,058
Nevada City S. of City.	2,121	1,942	2,578	2,123

Route 18. Merced to Route 40 near Sequoia (District VI)

Merced 1.6 Mi. E. at Interx. C.				
R. at 21st St.,				
W. on 18.....	2,199	2,165	2,280	2,046
E. on 18.....	2,010	2,164	2,241	2,075
W. on C. R.	1,898	2,051	1,894	2,032
Merced 12 Mi. E. at Interx. C.				
R. to Le Grand,				
W. on 18.....	1,237	993	1,515	1,142
S. on C. R.	86	52	114	90
E. on 18.....	1,272	1,013	1,561	1,183
Mormon Bar at Interx. with C.				
R. to Mormon Bar,				
S. on 18.....	1,372	1,023	1,651	1,155
E. on C. R.	311	196	321	237
N. on 18.....	1,374	1,068	1,581	1,161
Briarburg at Bear Creek Bridge.	1,251	930	1,465	959
El Portal 1 c. County Road,				
W. on 18.....	1,344	937	1,695	1,159
W. on C. R.	393	337	335	311
E. on 18.....	1,284	903	1,617	1,102

Route 19. From Route 9 West of Claremont to Beaumont via Riverside and Fullerton to Pomona via Brea Canyon (District VIII)

Los Angeles Co. Line E. City				
Limits Pomona	4,378	3,887	4,518	3,799
Ret. Pomona and Ontario at				
Chino Cross Rds.,				
W. on 19	3,856	3,223	4,192	3,233
N. on C. R.	1,267	1,195	1,270	1,363
S. on C. R.	1,697	1,481	1,675	1,528
E. on 19	1,897	2,739	3,695	2,684
East of Ontario, E. Cy. Lts. at				
Jc. of New S. Bd.-19-B,				
with Old Road,				
W. on 19, New Road	2,122	1,533	2,293	1,512
S. E. on 19	1,069	3,026	4,706	2,918
N. W. to Holt Ave.	2,300	1,606	2,235	1,616
At S. Bd.-Riv. Co. Line on 19	2,540	2,393	3,750	2,446
Winerville E. of Cy.	4,108	3,060	4,843	2,606

Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.
Riverside W. of Cy. at Santa Ana River Bridge.....	5,865	5,373	6,195	5,162
Box Springs, Je. Rt. 78,				
N. on 19.....	.....	.....	4,195	3,340
S. on 78.....	.....	.....	2,811	2,246
E. on 19.....	.....	.....	1,546	1,220
Hemet Jc.,				
W. on 19.....	.....	.....	1,121	790
S. on C. R.....	.....	.....	1,009	550
E. on 19.....	.....	.....	823	596
Benumont, Je. 26, W. on 19.....	883	724	1,068	778
District VII				
S. W. of Pomona, Je. Valley Blvd. and Brea Canyon,				
N. E. on Valley Blvd.....	.....	.....	13,002	8,062
S. on 19.....	.....	.....	4,016	1,835
S. W. on Valley Blvd.....	.....	.....	9,411	6,374

Route 20. Route 1 Near Arcata to Redding via Weaverville (District 1)

Arcaea N. of Cy. at Jc. Rt. 1.....	1,611	799	1,349	819
Blue Lake, Mad River Br. East.....	266	179	343	281
Willow Creek Jc. C. R. to Hoopa.....				
W. on 20.....	185	140	148	117
N. on C. R.....	195	117	171	118
E. on 20.....	223	139	150	99
Humboldt-Trinity Co. Line.....	264	171	218	154

District II

Big Bar Vicinity.....	124	108	135	184
Weaverville, 3 Mi. S.....	296	237	.....	.....
E. Douglas City Jr. Hayfork Rd.,				
N. on 20.....	.....	.....	140	127
W. on C. R. ....	.....	.....	85	75
S. on 20.....	.....	.....	121	130
Bet. Redding and Tower House				
at Schilling	368	296	378	338

Route 21. Route 3 Near Richvale to Route 29 via Quincy (District III)

Richvale Wye	439	384	411	334
Oroville W. Jc. Marysville Rd.,				
W. on 21.....	978	1,662	1,030	1,031
S. on Marysville Road.....	813	671	891	626
E. on 21.....	1,732	1,663	1,845	1,663
Oroville E. of Cy. Ridge Road.....	2,266	1,324	1,729	1,491
Oroville E. of River Road.....	227	195	237	178
At Feather River Br., River Rd.	147	44	165	70
Miners Ranch,				
W. on 21.....	1,158	542	988	513
S. on C. R.....	273	313	313	222
E. on 21.....	1,002	472	3478	200
Bidwell Bar Bridge.....	691	285	555	292
Wey Creek, E. of P. O.....	398	180	369	201

District 11

Meadow Valley,				
W. on 21.....	299	249	.....	.....
N. on C. R.....	105	133	.....	.....
E. on 21.....	262	204	.....	.....
Quincy	501	312	.....	.....
Quincy, Spanish Creek Br. on Rd.				
to Keddie	614	467	.....	.....
Paxton, Jc. Indian Falls Rd.,				
E. on 21.....	322	335	.....	.....
W. on 21.....	182	96	.....	.....
N. on C. R.....	357	325	.....	.....
Quincy, E., Jc. Marysville Rd.,				
E. on 21.....	309	257	474	378
W. on 21.....	358	299	539	425
S. on C. R.....	64	58	98	43
Blairsdon, Jc. Mohawk Road,				
W. on 21.....	.....	.....	438	329
S. on C. R.....	.....	.....	111	67
E. on 21.....	.....	.....	338	265
Jc. Rt. 29 on 21.....	358	242	302	205

Route 22. San Juan Bautista to Route 32 via Hollister (District V)

San Juan Bautista S. of Cy. at Je. Rt. 2.....	3,100	2,145	2,095	1,384
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District IV

Hollister, Jc. Rt. 32.....	521	232	1,005	581
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Route 23. Saugus to Route 11 at Alpine Jc. (District VII)

Saugus Jr. with Rt. 4.....	3,399	2,140	4,714	2,515
Palmdale S. of Cy. Lts.....	2,049	1,553	2,693	1,545
Lancaster Jr. with Rt. 59 to Neenach.....				
S. on 23.....	2,371	2,598	2,695	2,013
W. on 59.....	831	1,043	799	847
N. on 23.....	1,276	1,235	1,877	1,014
Los Angeles-Kern Co. Line.....	867	732	1,450	663

District IX

S. of Mojave Jc. 38 to Barstow,				
S. on 23.....	882	661	909	882
E. on 58.....	178	155	256	205
N. on 23.....	1,041	808	1,124	1,022
N. of Mojave Jc. 58 to Bakers-				
field,				
S. on 23.....	878	728	1,025	869
S. W. on 58.....	315	311	413	378
N. on 23.....	633	517	656	598
Freeman 1 Mi. N. Jc. Rt. 57,				
S. on 23.....	501	394	522	337
W. on 57.....	72	81		58
N. on 23.....	501	427	528	367
Kern-Inyo Co. Line				
Olancha Jc. C. R. to Keeler,				
S. on 23.....			410	553

Station location	July, 1931		July, 1932		Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.		Sun.	Mon.	Sun.	Mon.
E. on C. R.	.....	.....	32	31	S. on C. R.	.....	.....	1,455	1,483
N. on 23	.....	.....	572	419	E. on 26	.....	.....	2,490	2,289
Lone Pine S. Cy. Lts. C. R. to Keeler	.....	.....	.....	.....	S. Bd. S. of Cy. at N. end Santa Ana R. Bridge, Jc. 26-A & E,	.....	.....	.....	.....
S. on 23	695	563	305	227	N. on 26-A	3,342	3,268	2,988	3,052
E. on C. R.	169	138	68	78	W. on 26-E	2,686	2,182	2,673	2,053
N. on 23	857	673	337	243	S. on 26-A	5,593	4,675	5,088	4,599
Big Pine Jc. Rt. 63 to Oasis,	.....	.....	.....	.....	Bet. S. Bd. and Redlands on 26	.....	.....	.....	.....
S. on 23	979	740	740	607	at Jc. of Hunt's Lane,	.....	.....	.....	.....
E. on 63	131	182	57	67	W. on 26	5,311	4,622	5,000	4,439
N. on 23	980	733	705	554	S. on C. R.	430	302	405	305
Bishop ½ Mi. N. Jc. 76 N. to Laws	.....	.....	.....	.....	E. on 26	5,322	4,534	4,869	4,372
S. on 23	1,451	1,113	1,223	1,137	At Interx. with Mt. View Ave.	.....	.....	.....	.....
N. on 76	298	293	272	353	W. of Redlands,	.....	.....	.....	.....
E. on C. R.	50	31	31	32	W. on 26	4,726	4,044	4,553	3,820
W. on 23	1,336	881	966	795	N. on C. R.	822	816	638	739
Leevining Jc. Rts. 40 and 23,	.....	.....	.....	.....	S. on C. R.	890	773	712	749
W. on 40	279	315	264	233	E. on 26	4,623	3,917	4,401	3,629
N. on 23	587	657	466	390	Colton Ave. at W. Cy. Lts. of Redlands	.....	.....	.....	.....
Mono-Inyo Co. Line	1,056	594	780	565	S. E. of Redlands Jc. C. R. to Yucaipa,	.....	.....	.....	.....
Bridge at E. Cy. Lts.	567	550	403	431	N. W. on 26	2,644	2,593	2,948	2,767
Sonora Jc., Jc. Rts. 13 and 23,	.....	.....	.....	.....	E. on C. R.	518	565	546	615
S. on 23	371	309	297	263	S. E. on 26	2,159	2,056	2,430	2,184
W. on 13	110	89	104	64	At S. Bd.-Riv. Co. line	2,452	2,169	2,172	1,811
N. on 23	368	306	304	274	Beaumont Jc. Jack Rabbit Trail,	.....	.....	.....	.....
District X					N. W. on 26	2,045	1,814	2,244	1,897
S. of Markleville Jc. Rt. 24,	.....	.....	.....	.....	W. on 19	883	724	1,068	778
S. on 23	.....	.....	110	16	E. on 26	2,756	2,363	2,890	2,495
N. on 23	128	87	110	64	Banning W. of Cy. Lts.	2,827	2,443	2,795	2,516
W. on 24	121	81	85	46	At Jc. with C. R. to Palma Spgs.,	.....	.....	.....	.....
Jc. S. H. and C. R. at Woodfords,	.....	.....	.....	.....	W. on 26	1,420	1,357	1,512	1,409
S. E. on 23	169	103	168	179	S. E. to Palm Springs	238	229	269	242
N. E. on C. R. to Minden	247	121	294	128	E. on 26	1,337	1,208	1,313	1,238
N. W. on 23	244	149	215	125	1 Mi. S. of Indio at Jc., Rt. 64,	.....	.....	.....	.....
Picketts Jc., Jc. Rt. 34,	.....	.....	.....	.....	N. on 26	1,832	2,076	1,949	2,319
E. on 23	240	124	271	158	S. W. on 26	959	1,089	1,061	1,104
W. on 34	222	97	312	168	S. E. on 64	774	972	893	1,219
N. W. on 23	217	134	231	160	Coachella S. of Cy. at Jc. C. R. to Thermal and Mecca,	.....	.....	.....	.....
Jc. Rt. 11-Meyers	150	100	297	193	N. on 26	1,381	1,395	1,399	1,387
Route 24. Route 4, Near Lodi, to Route 23, Near Silver Creek (District X)					W. on C. R.	208	201	205	226
Lodi Jc. Rt. 4	1,311	1,251	1,450	1,255	E. on C. R.	231	211	190	233
Jc. Rt. 24 and C. R. to Ione,	.....	.....	.....	.....	S. on 26	1,241	1,191	1,232	1,228
W. on 24	1,866	1,094	1,418	1,081	At Imp. Co. Line	830	846	838	780
N. on C. R.	1,086	565	924	594	Vendel's Service Sta. 5 Mi. W. of Westmoreland	.....	.....	.....	.....
E. on 24	883	598	734	690	Westmoreland E. of Cy. Lts.	940	982	1,096	1,025
Bet. San Andreas and Valley Spr.	794	352	.....	.....	Brawley at W. Cy. Lts. Jc. with Western Ave.	1,706	1,786	1,944	1,989
Jc. Rt. 24 and C. R. to Vallicita,	.....	.....	.....	.....	W. on 26	2,572	2,910	2,677	2,895
N. on 24	696	321	728	359	N. on Cy. St.	285	252	212	256
S. on C. R.	183	111	244	157	E. on Cy. St.	2,423	2,901	2,503	2,685
W. on 24	691	318	694	333	S. on Cy. St.	516	488	514	576
Jc. Rt. 24 and C. R. to Murphys,	.....	.....	.....	.....	Brawley, Jc. S. W. of Cy.,	.....	.....	.....	.....
N. on 24	773	336	829	446	S. on 26	2,589	3,004	2,518	2,834
N. on C. R.	658	359	643	354	N. on Cy. Street	2,275	2,644	2,115	2,415
E. on 24	1,018	465	1,204	555	N. W. on Cy. St.	474	482	501	516
Jc. Rt. 23	121	81	85	46	El Centro W. of Cy. Jc. Rt. 12,	.....	.....	.....	.....
Route 25. Nevada City to Downville (District III)					N. on 26	3,342	3,905	3,293	3,896
Nevada City N. of Cy.	446	293	457	405	S. on 26	3,949	4,238	3,954	4,165
Camptonville S. 1½ Mi., Jc. Marysville Road,	.....	.....	.....	.....	W. on 12	2,937	3,255	3,082	3,880
S. on 25	275	163	269	178	E. on Cy. St.	2,701	2,714	2,819	3,774
W. on C. R.	111	57	120	59	Calexico, N. Cy. Lts., Jc. Mt. Signal Rd.,	.....	.....	.....	.....
N. on 25	304	188	281	183	N. on 26	.....	.....	2,473	2,396
Downville Jc. Rts. 25 and 36,	.....	.....	.....	.....	W. on C. R.	.....	.....	833	984
W. on 25	333	211	366	244	S. on 26	.....	.....	2,744	2,803
N. on 36	5	3	8	7	Route 27. El Centro to Yuma (District VIII)				
E. on 26	335	217	372	252	El Centro E. of Cy. at Jc. C. R.	.....	.....	.....	.....
Route 26. Los Angeles to Mexico via San Bernardino (District VII)					N. to Brawley and S. to Calexico,	.....	.....	.....	.....
Jc. San Gabriel Blvd. and Garvey Ave.,	.....	.....	.....	.....	W. on 27	4,149	3,268	2,830	3,432
W. on 26	.....	.....	7,157	5,631	N. on C. R.	562	400	266	345
N. on San Gabriel	.....	.....	6,496	4,050	S. on C. R.	491	312	218	252
S. on San Gabriel	.....	.....	5,786	3,343	E. on 27	4,114	3,242	2,647	3,170
E. on 26	.....	.....	6,817	6,165	El Centro E. of Cy. Lts.,	.....	.....	.....	.....
*El Monte, E. Jc. Durfee Ave.,	.....	.....	.....	.....	Sand Hills Maint. Sta.	669	567	612	538
W. on Valley Blvd.	.....	.....	9,867	7,713	Yuma at S. D. A. Plant Quarantine Sta.	2,265	1,946	1,947	1,664
S. on Durfee	.....	.....	2,970	3,253	Route 28. Redding to Nevada Line via Alturas (District II)				
E. on Valley Blvd.	.....	.....	11,117	8,442	Redding S. of Cy. at Jc. with Rt. 3	736	803	810	824
*Bassett, Jc. Covina Road,	.....	.....	.....	.....	Montgomery Creek	215	175	262	243
W. on Valley Blvd.	.....	.....	14,047	7,734	4 Mi. E. of Pittville at Mal. Sta.	341	291	.....	.....
N. on Covina Road	.....	.....	943	774	Canby	278	324	190	176
E. on Valley Blvd.	.....	.....	9,960	7,241	5 Mi. N. of Alturas at Jc. Lakeview Rd.,	.....	.....	.....	.....
*Pomona, W., Jc. Brea Road,	.....	.....	.....	.....	S. on 28	314	245	259	230
Rt. 19	.....	.....	.....	.....	N. on 73	181	107	130	126
W. on Valley Blvd.	.....	.....	9,411	6,374	E. on 28	174	136	139	106
S. on 19	.....	.....	4,016	1,835	East of Cedarville, 2 Mi.	168	101	73	69
E. on Valley Blvd.	.....	.....	13,002	8,062	Route 29. Red Bluff to Nevada Line Near Purdy's (District II)				
Pomona, W., Jc. LA-26-C, and Rd. S. to Valley Blvd.,	.....	.....	.....	.....	Red Bluff E. at Jc. Rt. 3	976	725	982	753
W. on 26-C	.....	.....	1,655	887	At Tehama-Pumas Co. Line	764	413	515	289
S. to Valley Blvd.	.....	.....	7,259	4,647	2 Mi. W. of Westwood	1,030	605	687	505
E. on 26-C	.....	.....	8,916	5,688	Susanville 1 Mi. W. of Town	1,020	586	822	664
* Not on State highway.	.....	.....	.....	.....	Susanville 1 Mi. E. of Town	1,765	1,567	.....	.....
District VIII					12 Mi. E. of Milford at Mal. Sta.	317	251	292	252
Pomona, E. Cy. Lts. at L. A. Co. Line	9,420	7,281	8,511	6,775	5 Mi. S. of Constantia at Maint. Sta.	.....	.....	.....	.....
Between Pomona and Ontario, Jc. Chino Rd.	.....	.....	.....	.....	Jc. Quincy Rd. with Rt. 29,	.....	.....	.....	.....
W. on 26	8,922	6,696	6,797	6,192	N. on 29	322	244	257	195
N. on C. R.	327	353	494	645	W. on 21	358	242	302	202
S. on C. R.	927	918	897	1,090	S. on 29	.....	.....	243	191
E. on 26	8,798	6,798	6,250	6,276	Route 31. San Bernardino to Nevada Line, Near Jean (District VIII)				
Bloomington, Jc. Rialto Road,	.....	.....	.....	.....	North of Cy. at Jc. with Mt. Vernon and Highland Ave.,	.....	.....	.....	.....
W. on 26	.....	.....	3,439	2,982	S. on Mt. V.	3,432	2,191	4,012	2,370
N. on C. R.	.....	.....	839	898	E. on Highland	4,193	2,159	4,501	2,160

Station location	July, 1931		July, 1932		Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.		Sun.	Mon.	Sun.	Mon.
W. on Highland.....	2,449	1,220	2,192	1,223	Colfax E. of Cy. Grass Val. Rd.,				
N. W. on 31.....	1,464	946	1,702	1,107	W. on 37.....	2,366	1,495	2,084	1,435
Verdement Jr. Rt. 31 and					N. on C. R.....	256	177	221	209
Kendall Dr.,					E. on 37.....	2,322	1,596	1,951	1,287
S. on 31.....	2,417	1,372	2,445	1,230	Emigrant Gap Jr. Rts. 15 and 37,				
S. on Kendall.....	771	552	813	610	W. on 37.....	1,974	1,170	1,749	970
N. on 31.....	2,510	1,508	2,433	1,940	W. on 15.....	211	85	276	98
Jc. Rt. 31 with State Street,					E. on 37.....	1,998	1,184	1,735	993
S. E. on 31.....	1,558	1,003	1,473	936	Donner Lake Camp.....	1,952	1,150	1,679	975
S. on State.....	872	407	873	407	W. of Truckee, Jc. with Rt. 38,				
N. W. on 31.....	2,143	1,256	2,120	1,195	S. to Lake Tahoe.....				
N. of Cajon Jc. C. R. to Swart-					W. on 37.....	2,937	1,846	2,999	1,719
out Valley.....					S. on 38.....	2,556	1,508	1,922	1,054
S. on 31.....	2,535	1,626	2,332	1,424	E. on 37.....	4,193	2,787	4,017	2,681
W. on C. R.....	968	255	867	216	Truckee E. of Cy. at Jc. with Rd.				
N. on 31.....	1,685	1,440	1,577	1,232	38 to Nevada Line.....				
Victorville, 11 Mi. S. Jc. Rt. 59,					W. on 37.....	3,210	1,943	2,201	1,507
S. on 31.....			1,427	1,096	E. on 38.....	2,775	1,599	1,913	1,145
N. on 59.....			164	112	N. to Hobart Mills.....	477	294	264	296
N. E. on 31.....			1,298	1,056					
Victorville S. of Cy. Lts.	1,504	1,255	1,370	1,222	Route 38. Myers to Nevada Line via Truckee River (District III)				
Helendale.....	964	862	870	886	Mays, Jc. Rts. 38 and 11,				
S. W. Town Lts. of Barstow.....	1,031	992	971	976	S. on 38.....	868	543	1,403	1,037
N. Barstow, Jc. Rt. 58, E. on 31	622	544	598	600	E. on 11.....	856	494	1,432	1,042
Yermo E. of Cy. Lts.....	494	423	432	483	N. on 38.....	842	520	1,376	994
Baker.....	426	399			Pomona.....	2,141	1,563	1,626	1,151
Baker, Jc. Lone Pine Rd.,					Tahoe City Jc. Rt. 39,				
S. on 31.....			402	493	S. on 39.....	1,696	1,287	2,910	2,071
N. on C. R.....			19	6	E. on 39.....	1,470	1,151	3,040	2,248
N. on 31.....			392	461	N. on 38.....	1,512	816	2,517	1,603
Nevada State Line.....	346	359	305	328	Donner Underpass.....			1,980	1,038
					Truckee, W. of Cy. at Jc. Rt. 37	2,556	1,508	1,922	1,054
Route 32. Route 2, Near Gilroy, to Route 4, Near Califa (District IV)					Truckee, E. of Cy. Jc. Rt. 37.....	2,775	1,599	1,913	1,145
Hollister Jc. Rt. 22,					California-Nevada State Line.....	2,907	1,480	2,113	1,135
W. on 22.....	721	626	1,140	761					
S. on 22.....	521	232	1,005	581	Route 39. Tahoe City to Nevada State Line (District III)				
E. on 22.....	1,227	808	1,814	1,214	Tahoe City Jc. Rt. 38.....	1,470	1,151	3,040	2,248
Pacheco Pass at Santa Clara-					State Line near Brookway.....	1,180	751	1,341	772
Merced Co. Line.....	1,597	987	1,563	1,020					
District VI					Route 40. Route 13, Near Montezuma, to Route 23, Near Mono Lake (District X)				
Junction-Jc. C. R. to Gustine,					Mt. Pass Jc. Rt. 13.....	400	185	486	359
W. on 32.....	1,611	1,066	1,483	1,015	1 Mi. E. of Groveland on 40.....	452	289	472	342
N. on C. R.....	441	274	373	209	Mono 40-A. Jc. with Mino-23-HL.	279	315	264	233
E. on 32.....	1,270	841	1,240	835					
Los Banos at S. P. Crossing	3,006	3,033	2,545	2,727	Route 41. General Grant Park to Kings River Canyon (District VI)				
(Near Maint. Yd.).....					W. of Hume.....	226	52		
E. of Los Banos at Jc. C. R. to					Jc. Co. Rd. to Hume.....				
Dos Palos.....	1,844	1,639	1,633	1,702	N. on 41.....			154	43
W. on 32.....	889	855	713	816	S. on C. R.....			74	34
S. on C. R.....	1,703	1,387	1,536	1,302	E. on 41.....			116	32
E. on 32.....									
Merced-Madera Co. Line at Jc.					Route 42. Saratoga Gap to State Redwood Park (District IV)				
C. R. to Merced.....					Saratoga Gap, Jc. Rt. 55.....	1,462	85	3,280	782
W. on 32.....	1,378	1,108	1,338	1,137	Waterman Switch.....				
N. on C. R.....	523	492	506	523	E. to Saratoga Gap on 42A.....	1,483	194	3,416	814
E. on 32.....	992	772	971	729	W. to Redwood Park on 42A.....	664	34	1,130	223
Califa Jc. Rt. 4.....	906	762	842	721	S. on C. R. to Boulder Creek.....	966	208	2,349	650
Route 33. Paso Robles to Route 4, Near Bakersfield (District V)									
Paso Robles E. of Cy. Lts.....	1,450	1,413	1,315	1,285	Route 43. San Bernardino to Big Bear Lake (District VIII)				
Paso Robles 1/4 Mi. E. of Cy. Lts	1,121	913	992	934	Foot Waterman Grade.....	6,148	2,343	4,941	2,236
Shandon Maint. Yard.....	670	516	647	459	Jc. Camp Seeley Road.....			4,939	1,793
District VI					W. on 43.....				
S. L. O. Kern Co. Line.....	534	348	467	263	N. on C. R.....			1,087	526
Blackwell's Cor. Jc. C. R. N. to					E. on 43.....			4,123	1,378
Coalinga and S. to Taft.....					Squirrel Inn Jc. of New Forest				
W. on 33.....	386	267	330	233	Hwy. with Old Crest Drive,				
N. on C. R.....	210	229	159	180	W. Old Road.....	1,518	309	499	222
S. on C. R.....	238	197	189	180	E. on 43.....	513	313	3,198	1,690
E. on 33.....	374	326	296	230	N. E. on Old Road.....	737	223	1,121	393
Lost Hills Inters. of Main St.,					S. on 43.....	3,036	821	4,416	1,448
W. on 33.....	712	663	463	510	Jc. Burnt Mill Canyon Road,				
N. on Main.....	35			64	W. on 43.....	3,068	1,013	3,285	1,133
S. on Main.....	192	167	95	120	N. on C. R.....	2,581	794	2,328	850
E. on 33.....	641	585	450	508	E. on 43.....	1,619	672	1,996	832
Wasco Jc. Co. Rd. S. to Wasco,					Jc. Kueffel Canyon Road.....				
near S. P. R. R. Xing.....					W. on 43.....	1,335	636	1,734	797
W. on 33.....	754	783	622	676	N. on C. R.....	422	227	506	152
S. on C. R.....	710	823	603	835	E. on 43.....	803	448	1,793	758
E. on 33.....	765	783	706	764	Running Springs Park Jc. Cy.				
Famoso Jc. Rt. 4.....	576	584	483	515	Creek Rd.,				
Route 34. Route 4, Near Arno, to Route 23, at Picketts Junction (District X)					N. W. on 43.....	1,510	535	1,707	677
Twin Cities Jc. Rt. 4.....	404	355	443	366	S. W. on Cy.-C. R.....	505	148	390	139
W. of Ione Jc. C. R. to Michigan					E. on 43.....	1,925	650	1,932	774
Bar.....					W. End of Bridge over Big				
W. on 34.....	88	35	70	43	Bear Dam.....				
N. on C. R.....	49	53	106	83	W. on 43-C.....	1,788	614	1,799	687
E. on 34.....	92	78	160	110	E. over Dam-43-E.....	1,662	614	1,604	623
W. of Jackson Jc. Rt. 65 to					N. E. on 43-D.....	831	296	979	418
Placerville.....					1 Mi. from end of Rt. 43 Jc. C.				
E. on 34.....	706	691	1,637	1,665	R. to Pinknot.....				
N. on 65.....	491	495	1,233	1,379	W. on 43 to Fawnskin.....	369	160	329	146
W. on 34.....	354	239	596	460	S. on C. R. to Pinknot.....	145	43	135	67
Pine Grove E. of Town,					E. on 43 to Baldwin Lake.....	390	168	341	170
W. on 34.....	539	277	428	244	Big Bear Lake Desert Rt. Jc. E.				
N. on C. R.....	259	178	380	238	of Baldwin Lake,				
E. on 34.....	785	433	806	482	N. to Desert, C. R.....			138	71
Jc. C. R. to Silver Lake,					W. to Big Bear Lake, C. R.			165	70
E. on 34.....	313	99	293	100	S. on E. side of Baldwin				
S. on C. R.....	220	65	143	60	Lake, C. R.....			28	10
W. on 34.....	96	96	322	92	Mill Creek Lower Control, Jc.				
Picketts Jc. Rt. 23 and 34.....	222	97	312	168	Big Meadows Road.....				
Route 35. Peanut to Kuntz (District I)					S. to Redlands, C. R.....			456	165
At Peanut.....	58	39	54	46	E. to Big Meadows, C. R.....			263	75
Route 37. Auburn to Truckee (District III)					N. to Big Bear Lake, C. R.....			223	95
Auburn E. of Cy.....	3,236	2,188	2,872	1,930					
Route 43. San Bernardino to Newport Beach (District VIII)					Bet. San Bernardino and Colton,				
					Jc. Mt. Vernon & La Cadena,			5,248	4,901
					N. on C. R.....			43	61
					E. on C. R.....				

Station location	July, 1931		July, 1932		Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.		Sun.	Mon.	Sun.	Mon.
S. on C. R.	12	13	10	11	Isleton Br. East End.	12	13	10	11
W. on C. R.			1,010	880	N. on 53.	864	998	475	409
Bet. Colton and Riverside, Jc. La			4,339	4,001	S. on 53.	2,888	2,286	2,401	2,011
Cadena and Iowa.					W. over Br. C. R.	2,426	1,941	2,115	1,821
N. on 43.			7,106	5,491	Thornton Interx. C. R.				
S. W. on La Cadena.			5,814	4,616	E. on 53.	1,239	1,181	1,189	921
S. E. on 43.			1,238	803	N. on C. R.	452	444	450	398
Prado, Jc. Rte. 77.					W. on 53.	1,102	966	1,043	863
E. on 43.			5,753	2,598	Lodi N. of City.	1,500	1,277	1,237	1,004
N. on 77.			748	437					
W. on 43.			5,956	2,525					
District VII					Route 54. Near Michigan Bar to Central House (District X)				
Olive, Jc. Anaheim Rd.					Michigan Bar, Jc. C. R. to Ione.			753	338
N. on 43.			4,434	2,896	W. on 54.			115	46
W. on C. R.			3,349	2,043	E. on 54.			692	297
E. on C. R.			1,655	980	Central House Jc. Rt. 65 to				
S. on 43.			2,469	1,646	Placerville and Jackson,				
Santa Ana Airport, Jc. Main St.,					W. on 54.	775	475	1,243	555
N. E. on 43.			3,692	808					
N. on Main.			12,063	3,855	Route 55. San Francisco to Route 5 Near Glenwood (District IV)				
S. W. on 43.			13,525	4,445	Swimming Pool	9,832	2,544	15,651	3,775
Newport, Jc. Rt. 60.					Jc. C. R. to Colma,				
N. on 43.	14,790	7,019	9,623	5,022	N. on 55.	7,387	1,275	10,542	1,438
E. on 60.	14,657	6,607	8,911	3,960	E. on C. R.	3,471	942	4,458	1,013
W. on 60.	12,840	5,183	8,280	3,640	S. on 55.	3,667	1,600	12,321	1,988
S. to Newport.	15,115	6,819	9,505	4,661	Jc. C. R. to Belmont at Dirt Dam,				
					N. on 55.	5,871	890	7,534	1,276
Route 44. Boulder Creek to Redwood Park (District IV)					S. E. to Belmont.	2,478	342	2,713	374
Boulder Creek at Park Line.	3,113	1,495	2,465	1,177	S. W. on 55.	7,023	977	7,394	1,329
					Jc. with C. R. West to Half				
Route 45. Willows to Route 3, North of Biggs (District III)					Moan Bay.				
Willows E. of City.	561	708	697	668	N. on 55.	6,998	958	7,011	1,230
Four Corners, W. of Butte City,					W. on C. R.	4,045	676	3,364	615
N. on 45.	369	371	302	209	S. on 55.	3,283	354	4,516	686
E. on 45.	444	398	305	214	N. on 55.	1,545	111	2,451	506
S. on C. R.	508	446	356	291	E. on C. R.	Under construction		1,702	454
W. on C. R.	142	163	124	134	W. on 42.	1,462	85	3,280	782
Butte City E. of City,					S. on 55.	42	10	26	4
W. on 45.	277	223	247	180	S. Cl-S. Cr. Co. Line Jc. Rts.				
N. on C. R.	113	104	69	63	5 and 55.	87	69	73	40
E. on 45.	135	117	135	95					
Cherokee Canal Jc. with C. R. to					Route 56. Carmel to San Luis Obispo via Cambria (District V)				
Richvale.					S. of Carmel Interx. Carmel Val-				
W. on 45.	149	199	102	97	ley and Big Sur Roads.	2,844	1,447	2,177	1,196
N. on C. R.	123	149	159	157	10 Mi. S. of Carmel at Garra-				
E. on 45.	125	174	103	129	pitas Ck.	400	192	481	226
S. on C. R.			30	48	San Simeon 1 Mi. S.	459	222	347	329
					E. of Morro.			1,461	1,010
Route 46. Route 1, Near Klamath River, to Route 3, Near Cray (District I)									
Klamath, Jc. Rt. 1 on D.N.-46-A	188	147	421	412	Route 57. Santa Maria to Freeman via Bakersfield (District V)				
Weitchpec, Jc. Rt. 46 and C. R.,					Santa Maria N. of Cy. at Jc. Rt. 2	283	146	199	135
C. R. to Hoopa.	22	22	23	12	At Interx. Rt. 57 and Suey Rd.,				
C. R. to Orick.	33	35	72	38	W. on 57.	283	130	238	101
E. on 46.	42	30	59	41	S. on Suey Road.	152	113	110	85
Thompson Creek	117	87	81	116	E. on 57.	408	198	298	153
					Bet. 2d Cuyama Xing and Kern				
District II					Co. Line on 57 B. C.	281	197	264	149
Cray N. of Cy. Jc. Rt. 3.	273	221	255	267					
Route 47. Orland to Chico (District III)					District VI				
Orland E. of City.	1,004	1,139	1,005	1,087	S. L. O.-Kern Co. Line.	337	236	222	151
Glanelli Bridge	850	695	864	688	Maricopa W. of Cy.	649	585	335	216
Chico W. of City,					Pentland at R. R. Xing.	546	518	590	534
W. on 47.	1,433	1,745	1,040	880	7 Mi. W. of Rt. 4, Jc. C. R. to				
N. on C. R.	699	692	512	312	Connor.				
N. on C. R.	299	396	316	202	W. on 57.	346	275	317	287
E. on 47.	1,818	2,120	1,095	914	N. on C. R.	47	59	61	40
					R. on 57.	315	222	264	198
Route 48. Near McDonalds to Mouth of Navarro River (District IV)					Jc. Rt. 57 and 4.	319	247	270	213
McDonalds Jc. Rt. 1.	420	244	213	254	Bakersfield at Easterly Cy. Lts.	2,762	2,534	2,786	2,547
Roonville on 48.	615	487	501	352	Bakersfield, 10 Mi. E. Jc. Co.				
Navarro 2.3 Mi. W. of Town.	422	510	411	205	Club Rd. on 57-E.	1,128	374	740	238
					Bodfish, Jc. C. R. to Caliente,	297	195	264	159
					S. W. on 57.	50	27	50	26
					S. on C. R.	371	191	295	151
					E. on 57.				
Route 49. Calistoga to Route 15 Near Lower Lake (District IV)									
N. of Calistoga at foot of grade.	1,653	841	1,223	669	District IX				
Middletown Jc. Cobb Mt. Rd.,					Freeman, Jc. Rt. 23.	72	61	81	58
S. on 49.	2,310	1,474	1,873	1,218					
W. on C. R.	852	638	828	598	Route 58. Bakersfield to Arizona Line Near Topoc via Mojave and Barstow (District VI)				
N. on 49.	1,851	1,278	1,466	987	Bakersfield, S., Jc. Weedpatch R.,				
Lower Lake Jc. Kelseyville and					W. on 58.			1,377	1,296
Lower Lake Road,					S. on C. R.			745	815
S. on 49.	924	547	711	387	E. on 58.			1,020	990
W. on K. Rd.	409	341	530	390	Monolith, at R. R. Xing on 58.			417	404
E. on 49.	1,196	814	1,028	703					
Jc. Rt. 15.	654	349	474	285					
Route 51. Santa Rosa to Schellville (District IV)					District IX				
Santa Rosa E. of City.	3,728	2,738	3,488	2,711	Mojave, N., Jc. 23, W. on 58.	345	311	413	378
Kenwood at Sonoma Cr. Bridge.	2,853	1,321	2,165	1,809	Mojave, S., Jc. 23, E. on 58.	178	155	256	205
Schellville Jc. Rt. 8.	2,314	932	1,664	769					
Route 52. Alto to Tiburon (District IV)					District VIII				
Alto Jc., Jc. Rt. 1.					Near Kramer, S. Bd.-Kern Co.				
W. on 52 to Alto.			2,121	1,390	Line	105	109	350	271
E. on 52 to Tiburon.	1,350	811	1,229	669	Barstow, N. of Cy. at Jc. 31 to				
					Yermo.				
Route 53. Fairfield to Lodi via Rio Vista (District X)					N. W. on 51.	615	576	498	499
Denver at Overhead Xing.	790	739	599	464	N. E. on 31.	622	544	598	600
Rio Vista Bridge E. End,					S. on 58.	1,247	1,171	996	1,015
W. on 53.	1,510	1,352	1,627	1,577	Daggett Jc. Arrowhead Trail Old				
N. on 53.	1,917	1,491	1,995	1,507	Trails Hwy.,				
S. on C. R.	1,240	845	1,016	925	W. on 58.	239	194	580	638
Walnut Grove Bridge N. End,					N. on C. R.			210	246
E. on 53.	2,104	1,758	1,823	1,400	E. on 58.	214	184	466	520
S. Over Bridge.	578	619	492	368	Vicinity Newberry Springs.	414	364	335	361
W. on C. R.	2,212	1,968	1,991	1,570	Vicinity Amboy.	385	285	301	319
					Near Bannock Jc. C. R. to				
					Searchlight.				
					W. on 58.	320	317		

Station location	July, 1931		July, 1932	
	Sun.	Mon.	Sun.	Mon.
N. on C. R.	65	51	.....	.....
E. on 58	368	365	.....	.....
Klinefelter, 2 Mi. S. E., Jc. new road.	.....	.....	.....	.....
W. on 58-New	.....	.....	289	296
N. on C. R.-Old 58	.....	.....	115	80
E. on 58	.....	.....	381	367
Needles W. of Cy. Lts.	516	560	596	627
Needles 5.7 Mi. S. Jc. to Parker and Blythe.	.....	.....	.....	.....
N. on 58	390	254	318	339
S. W. on C. R.	9	9	8	8
S. on 58	383	241	291	325
Route 59. Route 4 to Route 31 Near Cajon via Lancaster (District VII)				
Bailey Ranch on L. A.-59-A	113	101	272	171
Lancaster, Jc. Rt. 23, on L.A.-59-C	831	1,043	799	847
District VIII				
Jc. Rt. 31, on SBd.-59-A	.....	.....	164	112
Route 60. El Rio to San Juan Capistrano (District VII)				
El Rio Jc. Rt. 2 and 60	7,277	5,036	6,112	4,950
Oxnard S. of Cy. Lts. on Ven-60-A	6,113	4,063	5,418	3,122
Near L. A.-Ven. Co. Line, Jc. Decker C. R.	.....	.....	.....	.....
W. on 60	6,796	3,537	.....	.....
E. on 60	6,874	3,537	.....	.....
N. on C. R.	70	40	.....	.....
Topanga Canyon on 60	16,355	7,146	12,898	5,346
On C. R.	2,842	1,293	2,836	761
Santa Monica Interx. Beverly and L. A. 50-B Santa Ynez Canyon	.....	.....	.....	.....
W. on 60	20,734	9,238	15,518	6,414
On Beverly Blvd.	11,377	2,568	9,187	2,331
E. on 60	36,182	16,241	21,091	8,767
On Santa Monica Canyon Rd.	22,299	7,453	20,091	7,631
Lomita on Redondo-Wilmington Rd. on 60	12,655	8,637	7,850	6,264
Seal Beach at L. A.-Orange Co. Line	23,539	10,970	.....	.....
Seal Beach, Hathaway Ave. Jct., N. on 60 (New)	.....	.....	7,585	3,537
W. on 60 (Old)	.....	.....	11,397	6,939
E. on 60	.....	.....	18,721	7,801
Newport W. of Cy.	17,802	7,081	12,429	5,121
Newport at Interx. Newport-Tustin Rd.	.....	.....	.....	.....
W. on 60	12,840	5,183	8,280	3,640
N. on 43	14,790	7,019	9,623	5,022
S. on 43	15,115	6,816	9,505	4,661
E. on 60	14,557	6,607	9,911	3,960
Serra Jc. Rt. 2 and 60	7,273	3,636	4,730	3,079
Route 61. La Canada to Mt. Wilson Road via Arroyo Seco (District VII)				
Pasadena at N. Cy. Lts.	2,901	766	2,793	637
Route 63. Big Pine to Nevada Line via Oasis (District IX)				
Big Pine, Jc. Rt. 23	131	182	57	67
Route 64. Route 26 Near Indio to Arizona Line via Mecca and Blythe (District VIII)				
Indio, 1 Mi. S., Jc. Rt. 26, S.	.....	.....	893	1,219
E. on 64	.....	.....	.....	.....
Mecca, 2 Mi. W. Jc., Oasis Rd., N. on 64	.....	.....	402	425
S. on C. R.	.....	.....	169	197
W. on C. R.	.....	.....	26	43
E. on 64	.....	.....	336	408
Desert Center	78	54	112	123
Blythe, S. D. A. Quarantine Sta.	85	65	.....	.....
Colorado River Br., E. of Blythe	.....	.....	169	231
Route 65. Auburn to Sonora (District III)				
Auburn at Wire Br., Amer. Riv., N. on 65	341	150	543	358
E. on C. R.	292	102	138	129
S. on 65	303	159	435	269
Placerville N. of Cy. Jc. Georgetown Rd., N. on 65	345	303	381	297
N. on C. R.	160	168	136	170
S. on 65	240	270	412	464
El Dorado Jc. Rt. 11	330	258	429	417
District X				
Central House Jc. Rt. 54 to Michigan Bar, N. on 65	742	528	1,123	628
W. on 51	775	475	1,243	555
S. on 65	719	594	1,206	626
N. of Jackson Jc. Rt. 34, N. on 65	491	495	1,233	1,379
E. on 31	706	691	1,637	1,665
W. on 34	354	239	596	460
Mokelumne Hill, Jc. Westpoint Rd., W. on 65	.....	.....	355	263
E. on C. R.	.....	.....	131	118
S. on 65	.....	.....	274	184
San Andreas, S., Jc. Mt. Ranch Rd., N. on 65	.....	.....	1,130	720
E. on C. R.	.....	.....	263	249
S. on 65	.....	.....	1,034	653
W. of Sonora Jc. Co. Rd. to Jamestown, N. W. on 65	313	238	390	186
S. W. on C. R.	189	96	199	97
S. E. on 65	245	251	329	195
Route 66. Manteca to Route 5 Near Mossdale School (District X)				
July, 1931				
Station location	Sun.	Mon.	Sun.	Mon.
Mossdale Jc. Rt. 5	3,821	2,847	3,288	2,508
July, 1932				
Station location	Sun.	Mon.	Sun.	Mon.
Mossdale Jc. Rt. 5	3,821	2,847	3,288	2,508
Route 67. Pajaro River to Route 2 Near San Benito River Bridge (District V)				
San Juan Bautista N. of Cy. at Jc. Rt. 2	3,811	1,740	2,084	1,458
Route 68. San Francisco to San Jose (District IV)				
N. Cy. Lts. S. San Francisco	20,136	13,672	18,678	13,585
S. San Francisco at Underpass	19,508	12,311	17,960	11,951
Burlingame Jc. Rt. 68 and Broadway,	.....	.....	.....	.....
N. on 68	19,083	10,177	16,880	10,430
W. on Broadway	3,302	3,374	4,167	3,447
S. on 68	17,138	8,601	16,448	8,711
San Mateo, Jc. Third Ave., N. on 68	16,360	7,715	15,429	8,010
E. on Third Ave.	3,642	1,734	2,772	1,339
W. on Third Ave.	4,582	2,446	3,615	1,956
S. on 68	14,351	7,129	12,865	6,719
Redwood City at N. Cy. Lts.	.....	.....	11,991	5,952
Route 69. San Quentin Road (District IV)				
Calif. Park Wye, Jc. Rt. 1	4,465	2,315	3,527	1,779
Richmond to San Rafael Ferry	3,479	1,419	2,771	1,195
Route 70 (District IV)				
Ukiah Jc. Rt. 1	992	1,271	1,058	924
Route 71. Crescent City to Oregon Line (District I)				
Crescent City N. of Town at Maint. Yd.	1,107	1,223	841	819
Oregon Line	635	545	418	462
SECONDARY ROADS INCLUDED IN STATE HIGHWAY SYSTEM AUGUST 14, 1931				
Route 72. Weed to Oregon Line (District II)				
Weed-13½ Mi. N., Jc. Montague Rd.	.....	.....	210	121
S. W. on 72	.....	.....	24	14
N. on C. R.	.....	.....	235	135
N. E. on 72	.....	.....	.....	.....
Jerome-2½ Mi. N. Jct. Little Shasta Road,	.....	.....	.....	.....
S. on 72	.....	.....	198	223
W. on C. R.	.....	.....	48	79
N. on 72	.....	.....	204	192
Route 73. Alturas to Oregon Line (District II)				
Alturas-5 Mi. N.-Jc. Rt. 28	.....	.....	.....	.....
N. on 73	181	107	130	126
New Pine Cr. Quarantine Sta.	.....	.....	278	176
Route 74. Napa Wye to Carquinez Bridge (District IV)				
Napa Wye, Jc. Rt. 8, S. on 74	8,260	4,566	7,066	4,230
Jc. Sears Point Cut-off,	.....	.....	.....	.....
N. on 74	.....	.....	8,322	4,830
W. on Cut-off	.....	.....	515	273
S. on 74	.....	.....	8,005	4,678
Carquinez Bridge	*6,853	*4,164	*5,077	*3,487
* 24-hour count.				
Route 75. Oakland to Walnut Creek (District IV)				
Jc. C. R. to Orinda and Moraga, W. on 75	.....	.....	7,226	3,118
N. on C. R.	.....	.....	2,355	768
S. on C. R.	.....	.....	915	280
E. on 75	.....	.....	5,940	2,645
Route 76. Bishop to Nevada Line (District IX)				
Bishop, N. of City, Jc. Rt. 23, N. on 76	298	293	272	353
Jc. C. R. 5 Mi. W. of State Line, S. on 76	.....	.....	52	61
W. on C. R.	.....	.....	52	42
N. on 76	.....	.....	68	52
Route 77. Pomona to San Diego (District VIII)				
Prado, Jc. Rt. 43, N. on 77	.....	.....	748	437
†Corona, N. of Cy., Jc. Wineville and Pomona Roads, N. W. to Pomona	.....	.....	1,096	650
N. to Wineville	.....	.....	1,266	1,048
S. to Corona	.....	.....	2,193	1,648
Elsinore, 2 Mi. N., Jc. Perris Cut-off,	.....	.....	.....	.....
N. on 77	.....	.....	2,035	816
E. on C. R.	.....	.....	317	210
S. on 77	.....	.....	2,260	1,116
Elsinore, S. of Cy. at Union Oil Plant	.....	.....	2,170	1,281
† Not on State highway.				
District VII				
Bonsall, 2.6 Mi. S. Jc. Ocean-side Road, N. on 77	.....	.....	1,473	868
W. on C. R.	.....	.....	917	470
S. on 77	.....	.....	806	562
Miramar, 1½ Mi. S., Jc. La Jolla Rd., N. on 77	.....	.....	1,619	926
W. on C. R.	.....	.....	283	125
S. on 77	.....	.....	1,625	934

(Continued on page 40)

One-Room Schools Vanish as Improved Highways Increase

THE LITTLE red schoolhouse continues its retreat before the motor age. Its rate of disappearance is definitely proportioned to the rate of increase in improved highway mileage. Every acceleration in road construction is marked by a corresponding decrease in the number of one-room schools. In the old days it was necessary to take the school to the child because it was impossible to take the child to the school. Good roads have reversed that condition.

These points are well borne out by a recent comparative analysis of school and highway data by the American Road Builders' Association. These statistics, dealing with five typical states, reveal strikingly the meaning of better transportation to improvement in educational facilities.

In North Carolina, the analysis shows, there were 2989 one-room schools in 1924, and 1714 miles of improved highway. By 1930 the first class highway mileage had increased to 4025 while the number of single-room schools had declined to 1400. The State presents one of the most emphatic evidences of the principle that the consolidation of rural schools is entirely a matter of efficient transportation.

JULY TRAFFIC COUNT

(Continued from page 39)

Route 78. Riverside to Temecula (District VIII)				
Station location	July, 1931		July, 1932	
	Sun. 12	Mon. 13	Sun. 10	Mon. 11
Box Springs, Jc. Rt. 19,				
N. on 19.....			4,195	3,340
E. on 19.....			1,546	1,220
S. on 78.....			2,811	2,246
Perris, Jc. Hemet Road,				
N. on 78.....			3,159	2,611
S. E. on C. R.....			2,027	1,923
S. W. on 78.....			1,747	1,478
Route 79. Ventura to Castaic (District VII)				
Ventura-Jc. Rt. 2,				
E. on 79.....	3,074	2,354	2,786	2,197
Castaic, Jc. Rt. 4,				
W. on 79.....	2,031	1,343	1,798	1,022
Route 80. Zaca to Santa Barbara (District V)				
1 Mi. S. of Zaca, Jc. Rt. 2.....	187	140	208	116
Los Olivos $\frac{3}{4}$ Mi. S., Jc. C. R.,				
N. on 80.....			290	193
S. on C. R.....			124	109
S. E. on 80.....			224	108
San Marcos Pass, at Summit.....			545	238
Santa Barbara, Jc. Rt. 2,				
N. on 80 connection.....	1,040	582	711	391

Husband arriving home late: Can't you guess where I've been?

Wife: I can; but go on with your story.—*Rotary Reminder.*

TREES CLOSE TO HIGHWAYS

I think that I shall never see,
Along the road, an unscrapped tree

With bark intact, and painted white,
That no car ever hit at night.

For every tree that's near the road
Has caused some auto to be towed.

Sideswiping trees is done a lot
By drivers who are not so hot.

God gave them eyes so they could see
Yet any fool can hit a tree.

—Judge.

State Officers Named on Advisory Committee

C. C. CARLETON, chief of the Division of Contracts and Rights of Way of the Department of Public Works, has been appointed a member of the Advisory Committee to the California Motor Vehicle Legislative Committee by the chairman, Assemblyman William B. Hornblower.

The Legislative Committee was created by the last Legislature to review and study existing motor vehicle legislation and consider amendments and revisions. It will make a detailed analysis of suggested amendments to the act and report on the proposed revisions to the Legislative Committee.

Other State officials on the Advisory Committee are: Russell Bevans, Registrar and E. Raymond Cato, Chief of Enforcement, Division of Motor Vehicles; Vincent D. Kennedy, Railroad Commission; Daniel J. O'Brien, Department of Penology; Rolland A. Vandegrift, Chief of the Department of Finance and Ralph H. Taylor, Agricultural Legislative Committee.

Other members include representatives of automobile clubs, automotive industries, motor car dealers associations, chambers of commerce, farm bureaus, electrical railways, motorcycle and peace officers associations; traffic, county supervisors and underwriters association.

Fashion Note for Men—There will be little change in the trousers pocket this year.

Dad (describing animal)—And the cow carries two horns on her head.

Willie—And does she blow 'em to let you know she's coming, dad?—*L. A. Chronicle.*

STATE OF CALIFORNIA

Department of Public Works

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JAMES ROLPH, JR.-----Governor

COLONEL WALTER E. GARRISON-----Director

JAMES I. HERZ-----Deputy Director

DIVISION OF HIGHWAYS

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HARRY A. HOPKINS, Taft

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L. V. CAMPBELL, Office Engineer

T. E. STANTON, Materials and Research Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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L. H. GIBSON, District V, San Luis Obispo

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R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division

J. J. HALEY, Jr., Administrative Assistant

HAROLD CONKLING, Deputy in Charge Water Rights

A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

SPENCER BURROUGHS, Attorney

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Rights

A. N. BURCH, Irrigation Investigations

H. M. STAFFORD, Sacramento-San Joaquin Water
Supervisor

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CARLETON PIERSON, Specification Writer

C. O. PALM, Chief Clerk

C. E. BERG, Engineer, Estimates and Costs

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W. H. ROCKINGHAM, Mechanical Engineer

C. A. HENDERLONG, Assistant Mechanical Engineer

W. M. CALLAHAN, Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample

SEP 12 1932





CALIFORNIA HIGHWAYS and PUBLIC WORKS

STATE HIGHWAY 77
Through Palms to Peaks

Official Journal of the Department of Public Works
SEPTEMBER State of California 1932

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Highway Commission Recommends 31 Additions to State Road System

Report to Legislature Includes 12 Projects Totaling
86 Miles in Northern Counties and 19 Comprising
259 Miles in Southern Counties

By HARRY A. HOPKINS, Member California Highway Commission

THE most difficult and hardest task given the California Highway Commission and the Department of Public Works has finally been finished and is represented by the report under date of July 29 recommending proposed additions to the State Highway System.

While the list of roads recommended has been made public in accordance with legislative mandate, the detailed report is now being prepared in typewritten book form for presentation to Governor James Rolph, Jr., and the 1933 Legislature.

It will be with pardonable pride that the Commission presents this report to the Governor, first, because as unsalaried servants of the people we have honestly and conscientiously given the very best effort possible in working out the problems presented during our investigations and, second, because we, who have had this work to do, feel that we have not been hampered by political influence, sectional selfishness or motives of individual advancement.

LAW LIMITS MILEAGE

In the selection of those county roads recommended we were bound and controlled by the conditions and requirements set forth

in Senate Concurrent Resolution No. 10 of the 1931 Legislature. This resolution is relative to the orderly addition of new roads to the State Highway System, after engineering and economic studies by the California Highway Commission and the Department of Public Works. It refers to an executive message transmitted to the Legislature under date of

March 12, 1929, which stated in part that some highways not in the State Highway System were carrying a volume of State traffic far exceeding the local traffic, thus placing upon the counties an undue and heavy maintenance burden and that a larger mileage of such roads prevails in the southern part of the State.

The resolution then decrees that the following principles be observed in the inclusion of new roads within the State Highway System:

"Additions may during the next two years be made to the secondary State Highway System totaling not more than 15 per

cent of the existing secondary State highway mileage as now constituted under Chapter 794, Statutes of 1927, approved May 26, 1927 (State Highway Classification Act), said mileage to be added in the ratio of not less than three or more than four miles in the south to one mile in the north." This ratio



HARRY A. HOPKINS

Roadside Development in Southern California by Beautification Projects

With the advent of Unemployed Labor Relief, the improvement of roadsides in southern California has taken a step ahead of its usual rate of advance. Many projects have and will be carried out that, by reason of insufficient funds for this type of work, would still be on the proposed list. This is the first of two articles on the subject. The second will appear in a following issue.

By H. DANA BOWERS, Landscape Engineer

WITH few exceptions all roadside work done under the category of "Beautification" might well be called "Protection" or "Conservation," for aside from the fact that the roadsides are improved in appearance by such work the important economic factor is not to be disregarded.

The planting of roadsides as an economic factor is recognized when consideration is given to the proper planting of slopes and areas where annually thousands of dollars are spent on weed eradication to lesson fire hazard.

Evergreen ground covers planted on slopes that tend to erode and along roadsides to force out the natural weeds and grasses that constitute a fire hazard when dry, result in an enormous saving of labor and expense. The erosion of slopes continually demands attention, and the removal of sloughed material represents a large portion of the entire road maintenance and is a task that is never completed.

The same applies to the removal of weeds. A program of spraying and burning must be adhered to from year to year in order to maintain fire protection for adjoining property.

GOVERNED BY CLIMATE

Climatic conditions determine the advisability of plantings of this nature, for in the hot, arid interior valleys ample irrigation is essential and the cost of this operation is often greater than the regular cost of remov-

ing sloughed material and weeds.

Zerophytic plants of a decumbent habit of growth that will thrive in hot, dry, or desert conditions are often not suitable for dry slopes as they are apt to be more or less inflammable and would not develop fast enough to smother out weeds, etc.

Along the coast where atmospheric moisture is present, succulent ground covers may be planted at small cost and require no maintenance. Trees planted along the roads where the temperatures are extreme, materially reduce maintenance in that they shade the pavement and decrease the amount of expansion and contraction. Also where excess moisture threatens the subgrade, trees planted close together tend to absorb this moisture and protect the pavement.

LESS MAINTENANCE

An example of this is to be seen in the Imperial Valley. The extreme heat and the type of soil that "melts" in contact with water constantly menaces the pavement. Areas that are protected by trees have required less maintenance in comparison with the balance of the valley roads.

The economic features of such plantings are augmented by the creation of neat, trim roadsides that otherwise would be covered with weeds, or barren.

Following are brief descriptions of beautification projects accomplished largely by Unemployed Labor Relief during the last two years:



H. DANA BOWERS



**SYLVAN
CORNERS,**
created by planting
trees and shrubs,
transform
intersections from
rubbish-littered
eyesores into
beautiful small
parks.

ICE PLANT PAYS

big dividends to
the State when
used as a bank
cover. The cut
slopes in sandy soil
near Del Mar,
San Diego County,
washed down onto
the highway until
so protected.



**WALKING SAND
DUNES,**
approaching the
highway at the rate
of ten to twelve
feet a year, have
been halted by
planting beach
grass in long
rows along their
crests.

**ROADSIDE
BEAUTY**

is often achieved
by planting suitable
hardy shrubs
and bushes on the
barren slopes of
cuts, the selection
of plant species
depending of
course on climatic
conditions.



United States Senate Committee Investigates California's Water Plan

THE United States Senate Committee on Irrigation and Reclamation arrived in California on August 30, after a one day's stop at the Hoover Dam, and spent four days inspecting California's water project in the Sacramento and San Joaquin valleys.

Although California as yet has not gone before Congress with a definite proposal for Federal participation and aid in its state-wide water plan, much has been done to acquaint the Federal Government and its representatives with the State's water problem and the proposed plan for its solution. That the Federal Government is co-operating with the State in these matters, is clearly evidenced by the investigations and reports of Federal agencies made during the past three years.

The members of the Senate Committee were much impressed with the conditions and problems shown them during the investigation and trip. Senator John B. Kendrick of Wyoming stated: "We came not to criticize but to aid you. We realize the problem and we want to help you. We have visited Boulder Dam and can see the potential value behind that structure. We know what conservation of water will mean to you and we feel that it is the business of the Federal Government to give every possible aid at its command." * * * "One thing which looks hopeful for California is the fact that you are showing your own good faith by appropriations from the State

treasury in the sum of \$1,000,000 for the making of surveys and the preparation of plans for the project. You are not attempting to finance the entire project from the United States treasury."

GOVERNMENT'S DUTY

Senator John Thomas, of Idaho, chairman of the committee said: "The greatest of sympathy should be extended to you people in California. It is the business of the

national government to extend all possible aid for the conservation of water as well as other natural resources. I am certain other members of the committee feel the same way." * * *

"We are tremendously interested in these definite questions which we have heard presented. It seems to me that a great national policy should be expanded.

"Appropriations are being made all the time for flood control principally in the mid-west and south—we have a reclamation

policy now in the west—in every State you have the same problems, depleted water sheds and lowered water tables. We have an ample supply of water if it is preserved. We must adopt a policy of conservation and water supply.

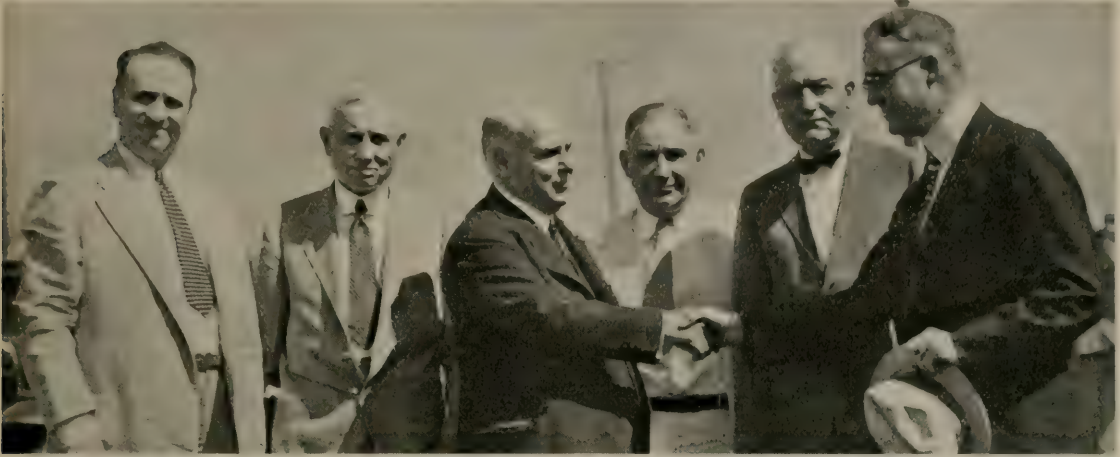
"It is just as much a part of the government to build these reservoirs as to develop their harbors, and the funds should come from the general treasury of the United States for the benefit of all the people."

CREDIT DUE GOVERNOR

THROUGH two committees which Governor James Rolph, Jr., has sent to Washington, the first within a month after his inauguration, and the second in June 1932, Federal authorities have been kept informed regarding California's water problems. Both the inspection trip of the House of Representatives' Subcommittee on Appropriations for the Department of the Interior made during the summer of 1931, and the recent investigation by the Senate Committee are the direct result of the activities of the Governor's committees.

Citizens Must Unite on Plan Says Dill

(Continued from preceding page)



A SMILING CALIFORNIA WELCOME was given these members of the United States Senate Committee on Irrigation and Reclamation by Governor James Rolph, Jr., when he met them upon their arrival at the city limits of Sacramento. In the picture (left to right) are seen Senator Henry F. Ashurst of Arizona; Senator John B. Kendrick of Wyoming; Governor Rolph; Col. Walter E. Garrison; Senator Robert D. Carey of Wyoming and Senator Robert B. Howell of Nebraska.

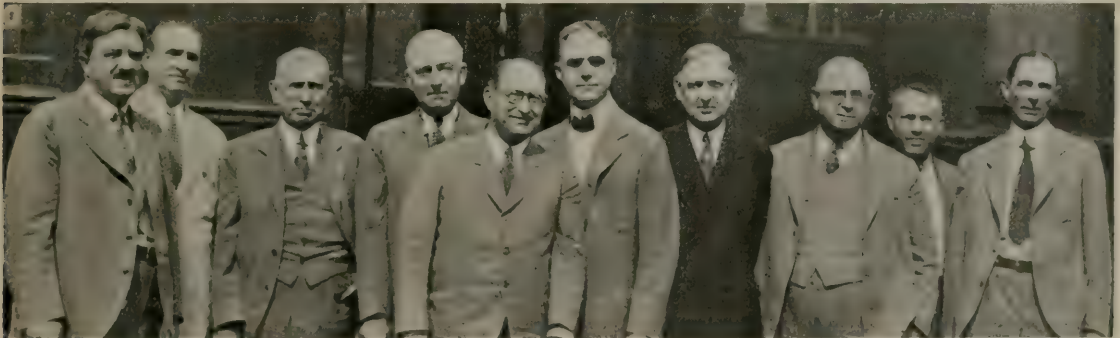
Senator Clarence C. Dill, of Washington, sounded a warning to this State when he said: "California can not expect Federal participation in its water conservation and development plan until all citizens unite on one program. You can not expect anything from Congress until you agree. When you lay a definite proposal before Congress you will find action."

COMMITTEE PERSONNEL

The personnel of the committee making the inspection trip was: Senator John Thomas, of Idaho, Chairman, and Senators Robert B. Howell, of Nebraska, Robert D. Carey, of Wyoming, John B. Kendrick, of

Wyoming, Clarence C. Dill, of Washington, and Henry F. Ashurst, of Arizona.

The investigation by the Senate Committee was authorized by Senate Resolution 177, 72d Congress, 1st Session, introduced by Senator Hiram W. Johnson, of California, and passed on June 27, 1932. The resolution authorized and directed the Committee on Irrigation and Reclamation, or a duly authorized subcommittee thereof, to make a complete investigation with respect to proposed legislation providing for the ultimate utilization of the water resources of the Sacramento, San Joaquin, and Kern Rivers in the State of California, including irrigation and reclamation, improvement of navigation, flood control, and



SIX SENATORIAL SOLONS, members of the United States Senate Committee on Irrigation and Reclamation who came to study and investigate California's water problem were photographed as they stepped off the train at Los Angeles. In the group (left to right) are: Senator Clarence C. Dill, Washington; Senator Henry F. Ashurst, Arizona; Senator John B. Kendrick, Wyoming; Senator Robert D. Carey, Wyoming; Senator John Thomas of Idaho, chairman; Senator R. B. Howell of Nebraska; Mayor John C. Porter of Los Angeles; R. F. Walter, Chief Engineer U. S. Bureau of Reclamation; Norman B. Adkison, Clerk of Committee, and P. W. Dent, Assistant Commissioner, U. S. Bureau of Reclamation.

Senators Made Four Day Study Tour

(Continued from page 5)

power development as outlined in House Document No. 791 of the 71st Congress, 3d Session, and to make a report of the results of such investigation with recommendations to the 72d Congress, 2d Session.

This important committee which will pass upon any legislation that may be introduced in Congress pertaining to the State Water Plan spent five days in California. They were met at Los Angeles by a delegation of citizens and an official welcome extended to them at a luncheon at Long Beach. In the afternoon an inspection trip of the harbor was made.

FOUR DAY TOUR

The committee then made a four day inspection trip and investigation of the Great Central Valley Project. The committee traveled by automobile from Bakersfield to Redding. It inspected the areas of deficient water supply in the Upper San Joaquin Valley and the salinity problem in the Sacramento-San Joaquin Delta, viewed the routes of the proposed San Joaquin River-Kern County Canal and the San Joaquin River Pumping System, visited the developed areas of the Great Central Valley, studied the navigation and flood control problems of the Sacramento and San Joaquin rivers, and inspected the Kennett dam site on the Sacramento River, the key unit of the Great Central Valley Project.

The Federal representatives accompanying the committee were: Colonel Thomas M. Robins, Division Engineer, Pacific Division, and Captain J. G. Drinkwater, District Engineer, Sacramento District, of the United States War Department, and the following representatives of the United States Bureau of Reclamation: P. W. Dent, Assistant Commissioner; R. F. Walter, Chief Engineer; H. W. Bashore, Senior Engineer and R. C. E. Weber, Superintendent, Orland Project. Secretary Ray Lyman Wilbur of the Department of the Interior and Dr. Elwood Mead, Commissioner of the Bureau of Reclamation were unable to join the trip because of previous engagements.

REPRESENTED GOVERNOR

Colonel Walter E. Garrison, Director of Public Works, acting as personal representative of Governor Rolph, met the Senators upon their arrival in Los Angeles and accompanied them throughout their entire trip. Rolland A. Vandegrift, Director of Finance; Edward Hyatt, State Engineer; A. D. Edmonston, Deputy State Engineer; and Major A. M. Barton, Chief Engineer, State Reclamation Board, accompanied the committee or met with it at some point on the trip.

A subcommittee of the California Joint Legislative Water Committee, composed of Senator Frank W. Mixer, Assemblyman Robert L. Patterson, and Assemblyman Edward Craig, were delegated by Senator Bradford S. Crittenden, Chairman of the Committee, to accompany the Senate Committee and assist in explaining the State Water Problem. Senator Crittenden, Senator C. C. Baker, Senator Andrew R. Schottky, Assemblyman John E. Frazier, and Assemblyman Frank S. Israel, of the California Joint Legislative Water Committee, met with the

United States Senate Committee meetings at different points on the trip.

D. K. Barnell, James M. Burke, Francis Carr, Shannon Crandall, Jesse Poundstone and A. B. Tarpey, members of the Governor's Water Resources Commission, accompanied the party on all or part of the trip or met with them at the meetings which were held, and assisted in presenting California's water problems and the proposed plans for the Great Central Valley Project.

PUBLIC MEETINGS HELD

Public meetings were held at Bakersfield, Visalia, Fresno, Stockton, Sacramento, Red Bluff and Redding. These were devoted to a presentation by State officials and prominent citizens of the water problems of the Sacramento and San Joaquin valleys and the upper San Francisco Bay region, of the proposed plans for the Great Central Valley Project to meet the immediate needs, and of the character and extent of the interest of the Federal Government in directly participating and assisting financially in carrying out the undertaking. The meetings were well attended by representative citizens.

Governor Rolph met the committee at the outskirts of Sacramento and escorted the members to the Capitol where he officially welcomed them, on behalf of the people of California. The Governor then took the Senators to Sutters Fort, and assisted by H. C. Peterson, curator, showed them many interesting relics of the days of '49. After visiting the Fort, the Senators were guests at a luncheon served on the palatial river boat, the "Delta Queen."

Immediately after the party had assembled on the boat, a two hours trip was taken, giving the Senators a view of the river, and demonstrating its importance as an artery of commerce. At the meeting held on the boat, Governor Rolph expressed the deep appreciation of the people of California for the personal investigation by the United States Senate Committee, stressed the importance of their mission and bespoke the full cooperation of the Federal Government and the State towards the early consummation of the Great Central Valley Project.

STATE PLAN DESCRIBED

At the meeting in Bakersfield, Assemblyman R. L. Patterson, Secretary of the Joint Legislative Water Committee, presided. Alfred Harrell, publisher of the *Bakersfield Californian*, State Engineer Hyatt and Senator John Thomas, of Idaho, spoke. After outlining the water problems and the project that the State has designed to relieve the existing water shortage in the Great Central Valley, Mr. Hyatt described the various features of the proposed project in which there is a Federal interest and in which the Federal Government has well established policies and precedents for financial participation therein. A printed bulletin on the Great Central Valley Project, was prepared by the Division of Water Resources for the Committee. The important features of Federal interest in the project are set forth in the bulletin as follows:

U. S. Interested in Twelve Features

(Continued from preceding page)

1. California's plan for development and utilization of its water resources is formulated under an unusually broad vision, coordinating and combining the most effective improvement of the streams for navigation and the most efficient development, regulation and utilization of the available water supplies for production of water power, control of floods, irrigation, public water supply and other purposes; and is in entire conformity with the objectives sought by the Federal Government as set forth in Section 3 of the River and Harbor Act of March 3, 1925, of "formation of general plans for the most effective improvement of such streams for the purposes of navigation and the prosecution of such improvement in combination with the most efficient development of the potential water power, the control of floods, and the needs of irrigation."

2. The Great Central Valley Project for the solution of the immediate water problems of the Sacramento and San Joaquin valleys in California is one of outstanding merit both intrinsically and as compared with projects either previously constructed or proposed for future development by the Federal Government.

3. The fundamental concepts of the Great Central Valley Project are in strict accord with the policies and principles enunciated by the legislative and executive departments of the Federal Government in regard to development of agricultural lands.

VITAL TO STATE

4. The Great Central Valley Project is not primarily a local one but on the contrary is a project of National concern and of unquestionable Federal interest, not only in the interests of navigation and flood control, but also in the interests of irrigation and power.

5. The consummation of the project is vital to a very large part of the State of California and to the entire Nation.

6. The project is of such magnitude financially that, unless material Federal assistance is justified and can be anticipated, its execution may be long delayed with resultant loss both to the State and Nation.

7. The Federal Government is justified in directly contributing to the cost of the project in the interests of navigation and flood control.

8. The Federal Government is justified in loaning to the State of California interest-free funds in the interest of irrigation and interest-bearing funds in the interest of hydroelectric power development, to finance the project.

9. The proposed plan of financing with direct Federal contributions in the interests of navigation and flood control, Federal loan of interest-free funds in the interest of irrigation and Federal loan of interest-bearing funds in the interest of

(Continued on page 34)



DISTINGUISHED GREETERS welcomed the members of the United States Senate Committee on Irrigation and Reclamation on their arrival in southern California and foregathered with them at a luncheon meeting in Long Beach under the auspices of the Los Angeles Chamber of Commerce. They are pictured in the above group as follows: Front row (left to right) W. F. Prisk, Press Telegram; Col. Walter E. Garrison, State Director of Public Works; P. W. Dent; U. S. Senators Carey of Wyoming, Thomas of Idaho, Howell of Nebraska; R. F. Walter, Chief Engineer U. S. Reclamation Service; Mayor Fickling, Long Beach; Supervisor F. T. Shaw; (second row, left to right) Major A. M. Barton, State Reclamation Engineer; Shannon Crandall, California Water Resources Commissioner; Rear Admiral H. H. Hough, U. S. N.; W. L. Brent; Wm. Simpson, Vice President L. A. C. of C.; P. H. O'Neill; Dr. Seager, Collector of Customs; Col. W. S. Miller, U. S. A.; J. A. H. Kerr; John F. Craig, President Harbor Board; I. M. Stevens; (Third row) G. T. Nicholson, Chief Engineer L. A. Harbor; Paul Graham, President Long Beach C. of C.; M. Q. Giffen; Lieutenant Governor Frank F. Merriam; A. L. Olinger, Secretary Long Beach C. of C.; State Engineer Edward Hyatt; Norman Adkison; A. S. Edmondston, Deputy State Engineer; Dwight Hart; J. W. McKinley, State Senator; Hugh Thatcher, Supervisor; W. C. Mullendore and Robt. Linton.

Lore and Beauty of the Mother Lode Highway Made More Easily Accessible

By R. E. PIERCE, District Engineer

THE words, "Mother Lode," to one even slightly conversant with early California History, always brings to mind the "Days of Old, the Days of Gold," when California was in the making, and even now, after a lapse of over eighty years, on a trip through the old mining towns along the Mother Lode Highway, one is reminded at every turn of the road of the activity that was prevalent in this area during the romantic days of the gold rush.

The recent letting of a contract for surfacing between Amador City and Martell will complete the State Highway connection between the Sacramento County Road at the county line near Michigan Bar and the Jackson lateral at Martell, thus making the southern mine area easily accessible from Sacramento over a modern highway.

The old road to this area prior to improvement by the State was not much better than a trail, and when passable, was a hard three-to four-hour trip. Often during the winter no passable route whatever was available to this section. Now with the completion of the State Highway, the trip to Jackson can be made easily in slightly over an hour.

GHOST TOWN "DIGGINGS"

Leaving Sacramento by the way of "M" Street and Folsom Boulevard, at Perkins we turn across the railroad and take the Jackson road. This County road, paved with cement concrete and asphalt macadam, is in fair condition to the County line 27.5 miles easterly from Sacramento.

One of the first evidences we see of the earlier mining activities is the old hydraulic "diggings" near Michigan Bar, a "ghost" town, which lies about a mile to the left, on the bank of the Cosumnes River. The ravages of time have obliterated most of the buildings in this once busy center of activity.

In the vicinity of Michigan Bar, we reach the rolling oak covered foothills of the Sierra Nevada, characteristic of this region, and shortly after, at the county boundary between Sacramento and Amador counties, the State Highway is reached, which was

graded and surfaced with screened gravel during 1923. This proving hard to maintain and dusty, was oil mixed in 1927, making a smooth, pleasant road to travel over.

RELICS OF PIONEERS

We see increasing evidences of the early mining activity as we progress, passing the picturesque old stone building at Forest Home, used as an inn during mining days. Reaching Central House, another early day roadhouse, we come to the Mother Lode (State) Highway, the left branch of which passes through Plymouth and Placerville and terminates at Auburn.

The right turn, which we take, leads through Drytown, the oldest town in the county and the first in which gold was found. This was a busy mining center and in its heyday was far from "dry." Only a few of the old buildings are now standing.

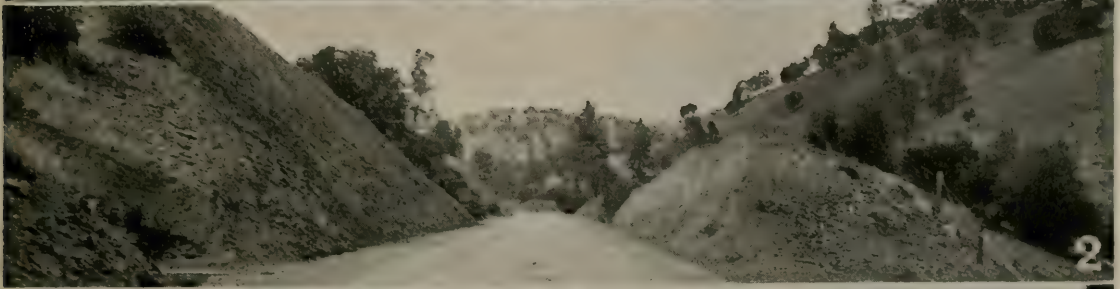
A short distance further, we cross Rancheria Creek, on which the settlement of Rancheria lay a short distance east, where a gang of Mexican desperadoes, one night during the 50's murdered several adults living in a rooming house, the only survivor being a small baby thrown out of a second-story window with her throat cut. She recovered, however, and lived to raise a family. The desperadoes were pursued by posses and were all eventually done away with under "Judge Lynch" law, some being hanged to a tree which formerly stood in front of the National Hotel in Jackson.

TRACES OF OLD TRAIL

Crossing through a saddle in the ridge between Rancheria Creek and Amador Creek, and following up the latter stream, we soon reach Amador City, a small sleepy village, where, due to the shutting down of the local mines, very little business is evident. The once active Keystone mine buildings here are showing signs of decay.

Here the new road starts climbing on a long easy grade with sweeping curves to the summit of the divide between Amador Creek and Sutter Creek. The old Amador Trail,

(Continued on page 23)



ALONG THE MOTHER LODE, where history was made in the "Days of Gold," a fine highway has replaced the trails of the pioneers. No. 1 shows the modern route through Drytown, a settlement that was far from "dry" in its heyday. It is the oldest town in Amador County and the first in which gold was found. No. 2 is a glimpse of the new highway looking north toward Amador City. No. 3 is a view of the scenic environs of Sutter Creek. Traces of the old Amador Trail may be seen along the stone wall on the right. No. 4 shows the Mother Lode Highway, now Main Street, in Sutter Creek, where many of the old buildings erected in the gold rush days are still standing.

Highway Commission Faced Hard Task

(Continued from page 1)

was set by the California Highway Commission on the basis of three miles in the south to one in the north.

DECIDING FACTORS

No money can be spent on these roads until they are finally included in the system by legislative act. To determine what roads were to be recommended the three main factors considered, in accordance with the resolution, were: "the large volume of State traffic that roads are now carrying, or by reason of the relief that they would afford to heavy traffic upon present State highways or as highways serving as important interstate links."

The study had to include an investigation into the engineering, economic and traffic facts involved and the report must be made to the fiftieth Legislature, embodying the recommendations and recital of such facts as may have been taken into account. The resolution further specifies that the investigation "shall begin not later than May 1, 1931, and shall be completed and made public not later than August 1, 1932."

OVERWHELMING DEMAND

Under the mandate of the Legislature the thirteen southern counties could be apportioned out of the entire State quota of 345 miles a total of 259 miles and the northern forty-five counties a total of 86 miles. The resolution having been known to the public since 1929 one would think the Commission's task an easy one. However, it was far from being an easy one. After receiving applications from all parts of the State we found on February 25, 1932, we had applications calling for 75 projects covering 2073 miles in the south and 2372 miles in the north or a total of 4445 miles from which we were expected to select 345.4 miles.

This large mileage and number of projects suggested for addition to the State Highway System made it practically impossible to arrive at a conclusion by any method of choice or preference. As Commissioner Timothy A. Reardon said at one of his hearings held to ascertain what a certain community desired: "Simple mathematics are operative when dividing 86 into 2372, being the mileage allowed and the mileage applied for in the north, but it takes more than a college professor to divide 2372 into 86 and arrive at a satisfactory conclusion" and we all agreed before long that the process was impossible.

THIRTY-THREE ROADS DISQUALIFIED

Consequently a method of elimination was necessary and those projects which could not qualify in accordance with the conditions of the Legislature's resolution were eliminated. Twenty-five projects totaling 1852 miles in the north and eight totaling 380.5 miles in the south were removed from consideration.

On July 12, 1932, there again appeared more applications. The north asked for 33 more miles and the south 274.2 miles. Again an elimination process had to be resorted to and 123 miles in the north and 412.7 miles in the south were eliminated. We now had 131 miles in the north and 1853 miles in the south to consider and pick out the 86 miles for the north and 259 miles for the south.

We, upon whose shoulders rested the responsibility of selecting the roads to be recommended, looked at the task from the viewpoint of State-wide interest. There never was suggested by any of the personnel considering the matter any method that would guide us in allocating mileage to any particular political subdivision. That might have been an easy method by which to confine the work to sections of the State. It also might stimulate a great amount of controversy in these sections.

MANY HEARINGS HELD

To fairly and consistently allocate this mileage necessitated additional labor. Hearings were held by the California Highway Commission as well as special hearings by individual members and groups of members at Sacramento and throughout the State from the most southerly part to the point farthest north as well as on the coast and in the valley areas.

At these hearings appeared organizations and individuals interested in certain roads that they urged for acceptance. It was the policy of the Commissioners to give everyone an opportunity to be heard and take as much time as they required. From these hearings was secured much valuable information that assisted us in finally arriving at our conclusions.

We particularly thank the boards of supervisors, city councils, State Chamber of Commerce, Automobile Club of Southern California, California State Automobile Association, Redwood Empire Association, San Joaquin Valley Travel and Tourist Association, San Francisco Convention and Tourist Bureau, local county and city chambers of commerce and many civic organizations throughout the State for the very fine support given in this work of investigation.

HUMAN FACTORS INVOLVED

It was very hard to have to decide against projects that in many instances had ardent supporters in great numbers. However the mileage limits prevented their recommendation. Then there were projects presented and supported by such logical argument that only the fear of violating the law kept us from being convinced they should be included. There was a strong human factor entering all these problems.

Following is the list of roads recommended for inclusion in the Highway System.

County	Description	Miles North
Mendocino	(a) State Highway Route 48, Navarro River to near Mendocino -----	10.3
Contra Costa	(b) Walnut Creek to Willow Pass -----	9.0
Madera	(c) Near Bates Station to Coarse Gold -----	18.0
San Benito	(d) San Juan Bautista to State Highway Route 2 -----	2.5

Roads Selected for State Adoption

(Continued from preceding page)

County	Description	Miles North South	County	Description	Miles South
Monterey	(e) Salinas - Castroville Road near Castroville to State Highway Route 2 near Prunedale	5.0	San Bernardino	(r) State Highway Route 19 near Brea to State Highway Route 77 near Chino	12.0
Napa	(f) State Highway Route 49 near Calistoga to St. Helena	8.0	Los Angeles, Orange	(s) State Highway Route 60 near Long Beach and Seal Beach to Santa Ana	12.0
Solano	(g) State Highway Route 7 near Vacaville northwesterly	5.0	San Bernardino	(t) South side of Big Bear Lake connecting State Highway Route 43	4.0
San Mateo, Santa Clara	(h) State Highway Route 55 to Portola Road Junction	6.0	Kern	(u) State Institution to State Highway Route 58 near Old Town	7.0
Lake	(i) State Highway Route 49 near Middletown northwesterly toward Cobb Mountain	7.0	San Luis Obispo	(v) State Highway Route 56 near Morro Beach to State Highway Route 2 near Atascadero	16.0
Tuolumne	(j) State Highway Route 40 near Mocassin Creek southeasterly	4.0	San Diego	(w) Oceanside to State Highway Route 77 near Bonsall	8.3
San Mateo	(k) State Highway Route 55 west toward Half Moon Bay	3.2	Imperial	(x) State Highway Route 26 near Brawley to Niland-Mecca Road	20.0
Kings, Kern, San Luis Obispo	(l) State Highway Route 33 in Cholame Valley to Coalinga - McKittrick Road	8.0 11.0	Riverside	(y) State Highway Route 26 near Whitewater to Palm Springs	9.0
Los Angeles, Orange	(m) State Highway Route 60 near Hermosa Beach to State Highway Route 43 in Santa Ana Canyon	26.0	Orange	(z) State Highway Route 60 near Huntington Beach to State Highway Route 2	20.0
Los Angeles	(n) State Highway Route 60 near Mines Field to State Highway Route 4 near San Fernando	2.0	Orange	(aa) Anaheim to State Highway Route 43 near Olive	4.0
Los Angeles	(o) State Highway Route 60 near Long Beach and Seal Beach to State Highway Route 9 near Lamanda Park	27.0	San Diego	(bb) Silver Strand State Park to State Highway Route 2	6.0
Ventura, Santa Barbara	(p) State Highway Route 2 near Rincon Creek to Ojai Valley via Casitas Pass	18.0	Los Angeles, Orange	(cc) Los Angeles near Compton to State Highway Route 2 near El Toro	29.0
Orange	(q) State Highway Route 2 near Miraflores to Norwalk	11.0	Tulare	(dd) State Highway Route 10 near Merryman to Tipton - Strathmore Road	15.0
			San Bernardino	(ee) State Highway Route 43 to Lake Arrowhead	1.7
			Total north		86.0
			Total south		259.0
			Grand total		345

Famous Rattlesnake Grade Loses 89 Kinks in Widening Improvement

By I. G. THOMAS, Office Engineer, District I

AS THE "Old Timer" travels north of Laytonville, Mendocino County, on the Redwood Highway to Rattlesnake summit and stops at the top and looks southward into the canyon of Ten Mile Creek and then northward down Rattlesnake Creek his mind wanders back a few years and he expresses himself most forcibly: "What a difference!"

He remembers that Willits, 32 miles south, was almost the end of the trail and the end of

which the highway is pushed through to the north, and travel becomes heavier, he feels that ever-increasing sentiment that the old Rattlesnake grade with its long steep climb and sharp turns was indeed a worry and danger to the traveler. He sees the ever-increasing demand for a change.

LOGICAL LOCATION

So in 1931 and 1932 the dream for something better is being realized.



SKETCH MAP of old and new road over Rattlesnake Summit.

the railroad when the California Highway Commission District Office was established there, and former District Engineer, Francis G. Somner had the difficult job of breaking through to the north and finding the best location for the new highway, consistent with the money available.

FOOD PACKED IN

He remembers how, in the early days, this particular Rattlesnake grade was constructed by the first convict camp in the State to a width scarcely great enough for two vehicles to pass, and how in those days even that was considered an ideal road for this part of the country.

The Old Timer does not forget either that at the first building of roads in this vicinity it was necessary to pack on mule back over newly built trails from the coast, much of the food and equipment required for the convicts in constructing these portions of pioneer road.

As his recollection and reminiscences continue through the succeeding years, during

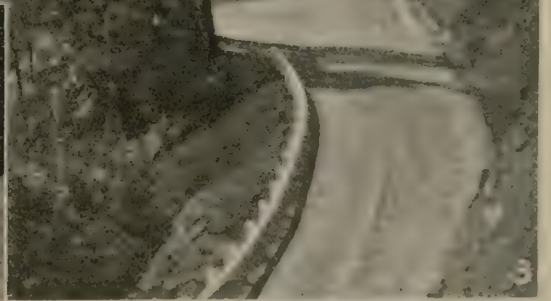
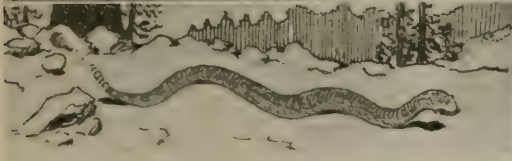
Relocation surveys were made and all possible general locations investigated but the old original location of Mr. Somners remained as the most logical location for the new road.

With greater funds available and more economical construction equipment to move the material, most of the sharp turns were replaced with straight lines or long sweeping curves, and now the Old Timer from his point of vantage on Rattlesnake Summit sees the traveler passing swiftly but safely over the new wide and dustless roadway over Rattlesnake hill. The old travel-worry lines have left the face of the passerby and Rattlesnake holds no more fears for him.

PLANS TELL STORY

The reflections continue: "Just what is the difference between the old road and the new one?" Old Timer climbs into his modern high-powered car and travels over a smooth, dustless highway through groves of mammoth Redwoods to the new District Office at Eureka

(Continued on page 18)



SNAKE CURVES, essential to the progress of the reptile and equally essential to the progress of roadbuilding through mountainous regions in the days of meagre highway funds and antiquated methods and equipment, have been eliminated as causes of delay and accident from a large part of the Rattlesnake grade on the Redwood Highway in Mendocino County. Picture No. 1 shows the wider, easier grade approaching Rattlesnake Summit. The narrow old highway is seen on the steep embankment at the right. No 2 shows another bad curve eliminated by straightened alignment and a fill. The pictures below, each bearing the number 3, were taken at the same spot and show the highway conditions before and after the improvement.

Thirteen Federal Aid Projects Under Way by Oct. 1, Totaling \$2,800,000

C. H. PURCELL, State Highway Engineer for California, reported to Colonel Walter E. Garrison, Director of the Department of Public Works, that during the month of September the Division of Highways planned to advertise sixteen major projects for construction on State highways at an estimated cost of \$2,319,200.

These projects include nine road jobs and seven bridge jobs. The road projects cover work on approximately 43 miles of State highway and amount to an estimated cost of \$2,078,100. The seven proposed bridge projects will involve the construction or reconstruction of eight structures which are estimated to cost approximately \$241,100. The work is distributed well over the State and involves construction in ten counties.

The Emergency Relief and Construction Act of 1932 which was approved by the President on July 21, 1932, will provide California with more than \$4,600,000 of Federal aid funds to be expended on highways before June 30, 1933. When it was known that this money would be available, the Division of Highways immediately laid plans for the construction of projects which were eligible for this advancement of Federal aid highway funds.

FEDERAL AID SECURED

Work on these projects was speeded up to the extent that the Division has already advertised four major projects which will be financed from the emergency relief funds; and of the projects proposed for advertising during September, nine of the sixteen will be financed from the Federal money. The thirteen Federal aid projects which will be under way by the end of the month are estimated to aggregate nearly \$2,800,000. Work on additional eligible projects is being rushed so that the State may take full advantage of these Federal funds for the relief of unemployment. The nine relief projects proposed for September advertising are indicated on the list of projects accompanying this report.

Following are brief descriptions of a few of the more important projects proposed for September advertising:

In Los Angeles County, an important improvement is to be made to that section of the Foothill Boulevard between the city of Tujunga and the town of La Canada. Lying just a few miles north of Glendale and westerly of Pasadena, this section of the Foothill Boulevard carries a large volume of traffic; and the existing 20-foot pavement has become entirely inadequate for week-end and holiday travel. The present improvement proposes the widening of the roadbed to 60 and 76 feet and placing a 30 foot asphalt concrete pavement over the entire project. With the exception of locations at a few curves which are to be flattened, the entire existing pavement is to be utilized as a base for the new pavement. This project will add four miles of modern suburban boulevard to this popular drive along the foothills of Los Angeles County.

PAVING RIDGE ALTERNATE

Another project in Los Angeles County which is of vital interest to the State as a whole is the proposed paving of the northerly portion of the Ridge Route Alternate on the twelve miles between Piru Creek and Gorman. Work on paving the southerly portion from Castaic School to Piru Creek is just begun, and a contract has recently been awarded for the construction of four bridges in Piru Gorge. The grading of the northerly portion, which it is now proposed to pave, is nearly complete and bridges across Gorman and Los Alamos Creeks are rapidly progressing so that the paving of the northerly twelve miles will be started without a break in construction activities on this most important realignment of the central artery of the State highway system. The present improvement provides for a 30-foot Portland cement concrete pavement.

Contracts for the construction of this highway, which will eliminate from the State road system the tortuous climb over the notorious Ridge Route, have been dovetailed and interlocked so that the improvement will be ready for public use at the earliest possible moment.

Sixteen Major Road Improvements Advertised for Bids in September

The following sixteen State highway projects with an estimated total cost approximating \$2,319,200 were planned to be advertised prior to October 1. These projects comprise nine road jobs covering some 43 miles of highway and 7 bridge jobs. Included in the list are 9 Federal Emergency Relief Fund projects.

DETAILED LIST OF PROJECTS

County	Location	Miles	Type
*Santa Clara	Oregon Avenue to Whisman Road	4.7	Port. Cem. Conc. Pave.
*Los Angeles	Between El Monte and Covina	4.3	Port. Cem. Conc. Pave.
*Alameda	Between Dublin and Castro Hill	6.5	Port. Cem. Conc. Pave.
Los Angeles	Piru Creek to Gorman	11.9	Port. Cem. Conc. Pave.
*Fresno	Fancher Creek to Fresno	2.7	Asphalt Conc. Pave.
*Los Angeles	Tajunga to La Canada	4.0	Asphalt Conc. Pave.
Monterey	San Ardo to San Lucas	4.6	Bit. Surf. Treatment
Mariposa	At Lorenes	0.2	Bit. Treat. Surf.
Monterey	San Remo Divide to Carmel River	3.7	Graded Roadbed
*Shasta	Across Fall River	----	Steel Stringer Bridge
*Shasta	Across Hat Creek and Pit River	----	2 Steel Stringer Bridges
Monterey	Across Wild Cat Creek	----	Reinf. Conc. Arch Br.
*Mendocino	Across Squaw Rock Slide	----	Timber Bridge
*Los Angeles	Across Topanga Creek	----	Reinf. Conc. Slab Br.
Humboldt	Across Mad River	----	Mov. Steel Truss Br.
Del Norte	Across Rowdy Creek	----	Repairing R. C. Bridge

*Emergency Construction Highway Project.

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement.....	27.4	\$1,507,800
Asphalt Concrete Pavement.....	6.7	357,200
Bituminous Surface Treatment.....	4.8	32,100
Graded Roadbed.....	3.7	181,000
Bridges	(8)	241,100
Totals	42.6	\$2,319,200

Earth and Earthwork in Highway Construction—Early Soil Studies

This is the first of a series of articles to be published in this magazine dealing with soil investigations made by the Highway Division of the California Department of Public Works with reference to the subgrades of existing highways and of projects planned for future construction. These investigations have extended over a number of years and the articles will cover the entire period up to the present time. This first article deals with early studies in soil analysis.

By **C. S. POPE**, Construction Engineer

ONE of the most important and possibly the least understood features in connection with successful highway construction is the proper selection and handling of soils used in the construction of subgrades. Without proper attention to this matter and to drainage, it is practically impossible to obtain satisfactory and durable road surfaces, and it has, therefore, been the practice of the Division of Highways for a number of years to insist upon as complete studies as possible of the qualities of the soils underlying its highways and of the treatment necessary in case of unsuitable soil. The studies described in these articles give some indication of the development of the science of soil analysis by the Division of Highways from 1924 to the present time.

In using the word earth in the title instead of the word soil, the writer has in mind a broader view of the subject than is usually conveyed by the term soil, which may be said to apply more strictly to those types of earth suitable to agricultural cultivation. Earth, on the other hand, may be said to apply to the mineral matter composing the surface of our globe and includes loam, silt, sand, gravel, clay, stone, and other such matter.

TESTS OF ADOBE

Aside from the title, however, accepted practice and convenience make the use of the word soil more desirable in the discussion than the word earth and for the purposes

of this article they will be assumed as synonymous.

The attention of the writer was first directed to a study of certain qualities of soil about 1910 when investigations were undertaken to determine the extent of certain physical phenomena connected with adobe soils.

Experiments with various samples of soil resulted in the establishment of the lineal shrinkage test and the tensile strength test as important in soil analysis.



C. S. POPE

In the lineal shrinkage test, soil, all of which would pass a 10-mesh screen, was mixed with water and moulded into a bar about ten inches long and an inch square. This bar was dried until repeated measurements showed no further decrease in length, and the percentage of shrinkage was held as an index of the suitability of the material for road foundation.

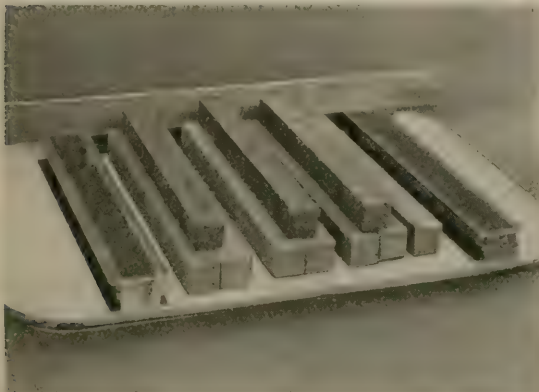
UNSATISFACTORY SOIL

As early as 1910, a shrinkage of more than 5 per cent in length was held as showing an unsatisfactory soil. Tension tests were made by molding briquettes similar to those used in cement testing and after drying, breaking them in a briquette testing machine. These two tests were used by the writer on work under supervision from 1910 up to the year 1924.

In 1921, the results of extensive investigations conducted by A. T. Goldbeck and



TAKING SAMPLES of soil from beneath existing pavement with a soil auger in 1923. The sample was taken in the white bag to the laboratory. Improved methods now prevail.



SOIL SHRINKAGE is shown by these test bars of earth samples after molding and drying.

F. H. Jackson of the Bureau of Public Roads were published and in 1922 a correlation of data so far obtained was published by J. R. Boyd in the Proceedings of the American Society for Testing Materials.

In 1928, A. C. Rose of the Bureau of Public Roads published in the Proceedings, American Society of Civil Engineers, an account of his experiments in soils and called particular attention to a simplification of method for determining moisture equivalent in the field.

OUTLINED PROGRAM

In July, 1923, the writer, then in supervision of the Testing and Research Laboratory, outlined a program for the field and laboratory analysis of soil which was undertaken and completed by F. T. Maddocks, Testing Engineer, in 1924.

The following matter is from a report prepared and presented to State Highway Engineer R. M. Morton in June, 1924:

"It was intended that this examination should be such that soils might be identified as to their general characteristics. Generally speaking, it was proposed that soils may be classed as of two kinds.



FIELD OUTFIT now used for soil testing, consisting of compaction cylinder assembled, tamping rod, compaction cylinder opened and piston.

(a) Adverse. (b) Safe Soils.

In the investigation made by the Bureau of Public Roads in 1920, the general tenor of the conclusions drawn seemed to be that adverse soils are confined to those in which swelling and shrinkage takes place.

It was the writer's belief that there should also be included those soils in which slip or displacement of particles takes place due to their shape and to water. This would, of course, include the clays, and also soils of low bearing power from other causes.

TESTS ADOPTED

Studies by the Bureau of Public Roads on the

(Continued on page 26)

Terms of Federal Emergency Relief Funds for Highways

CALIFORNIA is entitled to receive \$4,667,188 as its share of the \$120,000,000 provided by the Emergency Relief and Construction Act for expenditure in emergency construction on the Federal-aid highway system.

The act provides that the amount apportioned to any State may be used to match the regular annual Federal-aid apportionments and when so used this amount shall be available for expenditure in paying the share of the State in the cost of Federal-aid projects.

The funds advanced under the emergency act are to be reimbursed to the Federal Government over a period of ten years, commencing with the fiscal year of 1938, by making annual deductions from regular Federal-aid apportionments. The funds allocated under the emergency relief act are available only for work on Federal-aid highways performed before July 1, 1933.

STATE RANKS FIFTH

California ranks fifth in the amount each State may receive under this act. Texas is first with more than seven million dollars; New York second with more than six million; Pennsylvania and Illinois third and fourth, respectively, with more than five million. Arizona will receive \$1,760,771, Nevada \$1,575,756, Oregon \$2,001,740, and Washington \$1,920,470.

It is provided in the act that all contracts involving the expenditure of emergency funds shall contain provisions establishing minimum rates of wages to be predetermined by the State Highway Department which contractors shall pay to skilled and unskilled labor.

It is also provided that the maximum employment of local labor consistent with reasonable economy of construction shall be utilized. No convict labor shall be employed; thirty hours shall be the maximum for one week; and preference shall be given to ex-service men where they are qualified.

More Autos Than Voters

Although California long since put itself on record as having more automobiles registered than there are telephones in the State, the last election developed that in twelve counties there are more automobiles registered than there are registered voters, it is noted by the Automobile Club of Southern California.

Hollyhocks on Cuesta

Trim and stately, tall and fair, nodding to
the passers there,
Bright the blossoms that they wear—
Those hollyhocks on Cuesta.

Lovely ladies, shy but gay, frilly frocked,
they seem to say,
Bowling, nodding all the day,
"All is well up on Cuesta."

Fog descends along the way, wraps them in
its lacey grey,
Spanish shawls of olden day
For hollyhocks on Cuesta.

Brave those ladies, brave and sweet, on the
chasm's brink their feet,
Yet they nod to all they meet—
Friendly faces on Cuesta.

Cheerily greet you, cheerily smile, bowing
and fluttering all the while,
A gracious company, mile on mile—
Fair sentinels on Cuesta.

Spare a nod as by you ride; gallant ladies
those who bide
Watching ever by the side
Of the caverns of Cuesta.

Dainty dames from out the past, shy the
glances that they cast,
Bright their charm, long may they last
Cheering travelers on Cuesta.

—Nora Noonan Plover.

FAMOUS RATTLESNAKE GRADE LOSES 89 KINKS IN IMPROVEMENT

(Continued from page 12)

and examines the plans which reveal in themselves the complete story of the new Rattlesnake grade.

Eight-tenths of a mile or 13 per cent has been eliminated in the old distance of 6.33 miles.

Eighty-nine of the 123 sharp curves, of which many had a radius of only 50 feet, have been replaced by 34 curves, the sharpest of which has a radius of 500 feet and a total of 14 complete circles of curvature have disappeared.

The highway is now 30 feet wide permitting travel at high speeds in comfort and safety as compared with 16 feet or barely room for passing at low speeds on the old road.

It is no wonder the traveler of today has lost that worried look when touring over Rattlesnake grade, and into the land of the Redwoods.

Gasoline Tax Revenues Drop \$1,043,611 During First Eight Months This Year

By E. R. HIGGINS, Comptroller, Department Public Works

ASSESSMENTS levied for gasoline taxes thus far during 1932 have fluctuated in such a manner as to make it almost impossible to make an intelligent forecast of what may be expected as revenue during next biennium.

Total assessments levied for the eight months ending Aug. 31, 1932, amounted to \$27,342,660.64 as compared to \$28,386,272.19 for the corresponding period of 1931, a decrease of \$1,043,611.55 or approximately 3.68 per cent.

TEN PER CENT REFUNDS

The amounts given above are assessments levied by the Board of Equalization. Approximately 10 per cent of these amounts is deducted for refunds and to cover expenses of administering the gasoline tax acts. The remainder is apportioned one-third to the counties of the State, and two-thirds to the Division of Highways.

Assessments for the first three months of the year amounted to \$9,460,994.85 as compared to \$9,973,312.77 in 1931, a decrease of \$512,317.92 or 5.14 per cent. April showed a decrease of \$33,604.43 or .96 per cent while May showed an alarming decrease of \$664,709.18 or 16.41 per cent. June, on the other hand, due to abnormally large purchases by distributors in order to avoid the

Federal tax showed an increase of \$502,886.57 or 12.52 per cent over June of 1931. The July assessment again shows a decrease of \$193,607.91 or 5.89 per cent, and August, a further decrease of \$142,258.68 registering a 4 per cent shortage for the month compared with August, 1931.

Tax Loss by Months

REVENUES from gasoline tax assessments have shown a marked decrease over monthly receipts of 1931 for every one of the first eight months of this year with the exception of June when large purchases by distributors to avoid the new Federal tax produced an increase of 12.52 per cent over June of 1931. The difference in receipts compared with last year are shown in the following figures:

	Increase	Decrease
January		
February		\$512,317 92
March		
April		33,604 43
May		664,709 18
June	\$502,886 57	
July		193,607 91
August		142,258 68
Totals	\$502,886 57	\$1,546,498 12
Less increase		\$502,886 57
Net decrease		\$1,043,611 55

MOTOR FEES DROP

Motor vehicle fees for the first six months of 1932 decreased \$667,608 or 10.81 per cent. This fact coupled with an increase in expenditures of the Department of Motor Vehicles, means a further decrease in the revenues accruing to the Division of Highways. The revenue from motor vehicle fees after paying expenses of the Department of Motor Vehicles in an amount not to exceed 35 per cent of the total revenue from such fees is apportioned equally between the counties of the State and the Division of Highways.

With the constantly increasing decline in automobile registrations in this as well as in other States and the approach of the winter season when much less driving is possible on recreational highways, a continued decrease in

sales of gasoline is to be expected.

The decrease in total motor vehicle registrations for this State from January to August was 72,943.

New Building Operations Providing 683 Additional Cells at San Quentin

By **W. K. DANIELS**, Administrative Assistant, Division of Architecture

BACK in 1877 when the California State Board of Prison Directors was composed of Governor William Irwin, Lieutenant Governor James A. Johnson and Secretary of State Thomas Beck, a cell building was erected at the California State Prison at San Quentin to care for persons who were careless about writing checks on someone else's account, appropriating articles that did not bear their own trade marks, etc.

At a cost of approximately \$70,000 this cell building was built to contain 204 steel cells having steel floors, walls, ceilings and doors and to make the margin of security greater a heavy masonry wall of brick was constructed entirely around the steel boxes.

At the time this cell building was constructed ventilation and sanitation were not considered to such a degree as at present and these matters were postponed for a later generation to provide.

PRISONERS INCREASING

This year of 1932 finds the prisoners increasing in number thereby making it necessary to construct more cells so it has been decided to tear down the old cell building erected in 1877 and construct in its place a modern cell building. This is being done at a cost of \$245,000.

The new cell building is of reinforced concrete construction designed in modern style of architecture. The cells, or cell block, as it is commonly called, are built in tiers in the center portion of the structure and are separated from the outside walls of the building.

The tiers are six stories high, five floors being devoted to the housing of ordinary prisoners and the sixth floor to solitary confinement.

The solitary confinement area contains 68 cells, baths, guards' bedrooms, etc., making the unit complete in itself and thereby mak-

ing it unnecessary for the prisoners to leave the quarters.

BETTER VENTILATION

There are 83 cells on a typical floor. The cells are 4'-6" wide, 11' deep and 7'-6" ceiling height. Each cell contains a double tier bed, wash basin and toilet. The cell fronts facing the outside wall of the building have steel grilles including door. This provides the maximum amount of natural light and ventilation and in addition mechanical ventilation is supplied.

The cells are entered from continuous balconies on each tier reached by stairways. The windows in the building walls are operated by mechanical operators from the ground floor.

The building by measurement will be 64' wide and 252' long and will contain a total of 483 cells.

Guard walks are constructed on the inside of the building walls making observation of the cells possible at all times. Three guard towers are located on the roof.

BUILDING MORE CELLS

To provide for the steady increase in the number of prisoners arriving 200 additional

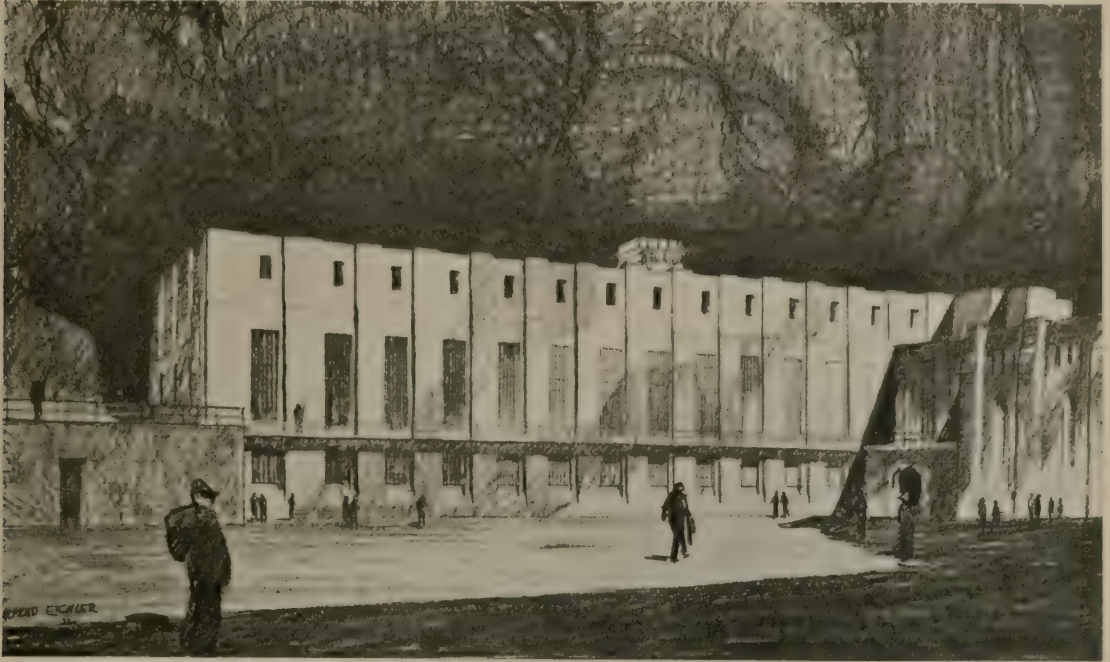
concrete cells are being constructed at a cost of \$50,000. These additional cells are being built on top of the present main cell block and are of the same construction as the new cell blocks.

The objective in the new cell block construction is to provide housing facilities with the maximum in sanitation, ventilation and security. The grille cell doors are locked by means of special prison locks and by a locking device controlling 20 cells at one time. By this system each and every one of the cell doors is under control of the guards.

When the prisoners are locked up for the night they stay locked but the system permits quick release in the event of emergency.



W. K. DANIELS



LATEST STYLE in prison keep construction will be this new cell block and solitary confinement building to be erected at San Quentin in place of the old one recently demolished. Modern in design as shown in the above sketch by artist A. E. Eichler of the Division of Architecture, the six story building will provide 483 additional cells in six tiers, each cell $4\frac{1}{2}$ feet wide by 11 feet deep and $7\frac{1}{2}$ -foot ceiling height. The building will be 64 feet wide and 252 feet long.



GOING DOWN under the hammers, crowbars and steel-cutting tools of a wrecking crew is this old cell building that was considered the last word in prison fastness construction when erected at San Quentin in 1877. It was a block of 204 steel cells built with the idea of security uppermost giving minor consideration to ventilation and sanitation features. It is being replaced by a larger, more modern structure.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

COLONEL WALTER E. GARRISON.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 SEPTEMBER, 1932 No. 9

ROAD WORK PRAISED

Road work and road repairs by the State and county on the local highways and roads have and are still going good. The State crew with headquarters at Lancaster has finished the shoulders of the highway from Mojave to Palmdale, in a blue-ribbon order for cleanliness and finish.

The workers at the Mojave headquarters of the State highway have had a world of hard work in repairs on the Midland Trail, caused by the heavy rain and snow storms of last winter. The Labor Day holiday crowd, the largest since Kern's flower Sunday, traveling mostly in the evening, had plenty of good expressions for the desert's well-kept-up highways.

The hard-working bunch of the Kern County road camp at Mojave has surely put in a real summer's work in oiling the Mojave town streets and oiling of the Randsburg road connecting with the Midland trail.

Another crew of the local State highway is doing splendid work on the Barstow oiled road. Near the town of Mojave they are installing extra large metal culverts that will carry the heavy flow of waters that are caused by winter rains.

Since the finish of the Barstow highway and its reputation for care and attention by local workers, a decided increase in eastern travel is noted by the local hotels, cafes and service station.—*Mojave and Randsburg Record-Times.*

TEN PER CENT LESS TRAFFIC

Returns from the traffic census recently conducted at numerous locations over the State trunk highway system, although not yet complete, indicate a reduction in motor vehicle travel of approximately 10 per cent, a recent highway bulletin reports.—*Minneapolis Highway News.*

Gas Tax, Motor Fees Make Our Highways All Self-Liquidating

A NEW conception of highway financing based on the fact that gasoline taxes and motor vehicle license fees are in reality tolls for the service rendered by highways, thereby making highways "self-liquidating" in fact, has been advocated by the American Road Builders' Association.

An editorial in a recent issue of the Engineering News-Record calls attention to the public obligation to take advantage of the recent action by Congress placing 1½ billion dollars at the disposal of states, counties and cities for self-liquidating public construction in order to create employment. "Problems of the utmost difficulty are involved in changing from a basis of taxation to one of tolls as required by the Reconstruction Finance Corporation Act," the editorial states.

CONTINUED DEMAND

"While the fact that motor vehicle taxes are tolls for the use of highways has been recognized by tax experts, the self-liquidating feature of such tolls has not received general public acceptance. That highways are truly self-liquidating is evidenced by the continued public demand, even in time of depression, for better and safer highways that provide more economical travel," states T. H. Cutler, president of the American Road Builders' Association.

"As affecting the present unemployment emergency, the speed with which the \$120,000,000 highway aid to the states granted by Congress is now being translated into jobs for men working on needed highway improvements demonstrates the effectiveness of road building in putting men to work quickly.

INCOME PAYS COSTS

"The conception that motor vehicle taxes can be used for any purpose other than payment for highway service is contrary to the original intent of such imposts, and it constitutes an extremely dangerous idea to the general public.

"The income from the service tolls on motor vehicles pays most of the highway costs, and the savings to the public due to improved roads more than pay the remainder. These service tolls make highways self-liquidating in fact," he concluded.

Mother Lode Has Deepest Gold Mine

(Continued from page 8)

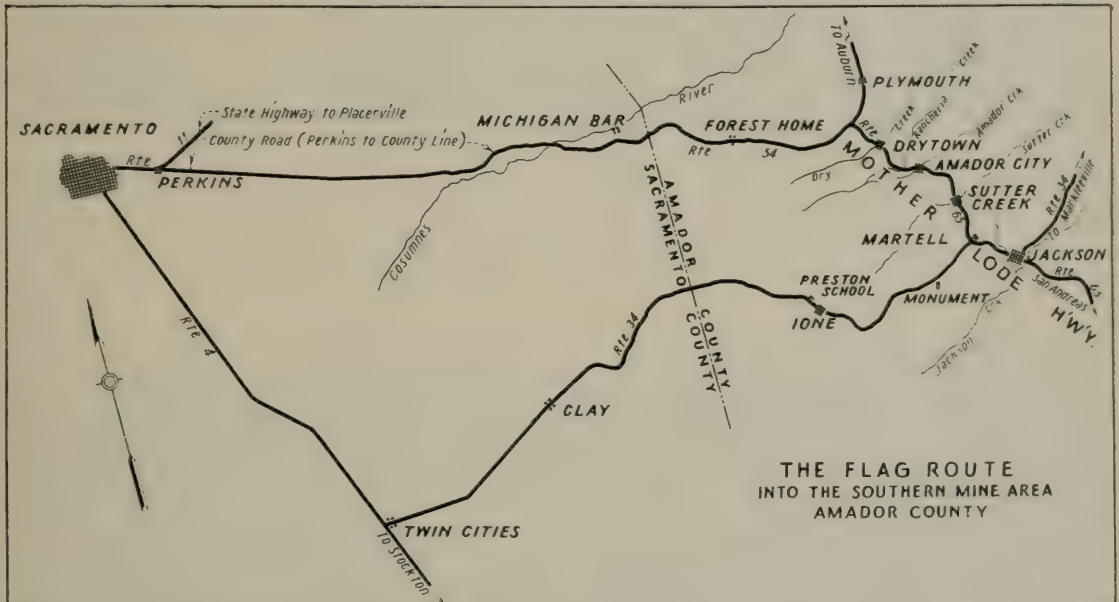
the first road in this region, also crossed the divide here and traces of it can still be found. Below and to our left is seen the old narrow road, with its sharp turns and steep grades.

After clearing the summit cut, we see the charming town of Sutter Creek below us, and are soon passing the neat residences, with their luxuriant trees, lawns and shrubbery. Many of the old, original buildings are still in use, but unfortunately, the tendency is to replace these old buildings with modern

then we pass Martell, the terminus of the Amador Central Railroad. This railroad extends from Ione to Martell, and it is claimed that it is the shortest railroad in the United States under separate ownership.

DEEPEST GOLD MINE

We now reach the junction of the Mother Lode Highway and the Jackson Lateral State Highway, which though having a different route number and designation is still a part of the Mother Lode Highway as far as Jack-



MAP showing Mother Lode Highway and laterals.

fronts, and if the local people can not be brought to see that they are destroying their most valuable asset, these old buildings will soon be a thing of the past. Some mining activity is going on here, and the town has a prosperous look.

SHORTEST RAILROAD IN U. S.

Passing through the business district, we traverse several long, sweeping curves, and are soon high above the town, which looks very attractive from this elevation. A little further on, we pass under a high trestle carrying a flume for the disposal of tailings from the Central Eureka Mine, which has been in active operation for many years, and

son. Following this road easterly, we pass through the workings of the famous Argonaut Mine, where nearly fifty miners were suffocated by fire in the shaft several years ago.

A short distance to the left is the Kennedy Mine, which recently has placed a hoist at the 4200-foot level, and work is now going on over a mile below the surface, making it the deepest gold mine in America.

Our attention is soon drawn to the Orthodox Servian Church, a white building surrounded by headstones, atop a hill, a short distance to the left on the outskirts of Jackson.

Due to the two large mines in active operation, Jackson's population includes many

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Study Shows Higher Speed Reduces Safe Capacity of Highway

INTERESTING disclosures regarding the relation of speed to the capacity of a highway are set forth in the report of a recent study of vehicular traffic.

It is shown that increasing the speed at which traffic is moving does not necessarily increase the number of cars passing a given point for a fixed period, as would naturally be thought. Theoretically, the faster the traffic moves, the greater the number of cars passing a given point per hour, thus increasing the capacity of the street and the amount of vehicular traffic which it can handle.

From a practical standpoint, however, this is not true because as the speed increases, the distance between automobiles required for safe driving also increases. The studies show that at speeds higher than $23\frac{1}{2}$ miles per hour the safe distance necessary between the cars increases so rapidly that it more than counteracts the increase in speed with which traffic is moving and, in fact, reduces the number of cars which can pass a given point per hour with safety.

As an illustration it is shown that at $23\frac{1}{2}$ miles per hour a safe hourly capacity of the traffic lane is 2600 cars. At 45 miles per hour, although the speed is almost doubled, the safe distance between the cars has more than doubled and the capacity is but 1760 cars an hour.

"Life Lines" of the Highway Win Tribute

Respect for the white traffic lane lines as the "life lines" of the highway is urged in a recent communication to the California State Automobile Association.

"As helpful as the life line shot out from a sinking ship, is the white traffic line," the writer stated, "for it places a label on the 'road hog,' warns against the 'human jack-rabbits' who weave in and out of traffic, and is ever ready to protect the obeying motorist against the highway chance-takers. It is always a line of safety—and often the very narrow thread between life and death."

There are 4,134,675 passenger automobiles and 900,395 motor trucks owned on farms in the United States, according to a recent statistical survey.

Public Works Exhibit Drew Thousands of State Fair Visitors

THE 78th Annual California State Fair has passed into history, and with its passing goes the feeling of President A. B. Miller and his fellow directors that it was an unqualified success despite the adverse condition of business.

The racing program was the best in a quarter of a century, as had been promised by Charles W. Paine, Secretary-Manager.

The horse show attracted record attendance, and was declared to be the best in the history of the big exposition.

The display of the State's resources—horticultural, agricultural, mineral and live stock, along with industrial activities—while in some respects not up to normalcy in number of exhibits, was much higher in quality than ever before.

DROP IN ATTENDANCE

Officials were highly gratified when the final attendance figures were compiled. The turnstiles clicked 322,468 times in 1931, for an all-time eight-day record. This year the total was 269,636, a drop of 16 per cent.

Many thousands of visitors passed through the large booth of the State Department of Public Works in the Western States Building. By means of photo-enlargement, models, maps, charts, drawings, blueprints, reliefs and other materials, all accompanied by explanatory text matter, this Department made an impressive display, compatible with economy, illustrating the activities of the several divisions of this important branch of the State government under the directorship of Colonel Walter E. Garrison.

In the center of the exhibit space was a large relief map of the State, upon which is shown the entire State Highway System, the location of all State institutions, besides the usual geographical delineations of towns, cities, rail lines; waterways and other natural features.

Wall exhibits consisted of hand colored photo enlargements of highway scenes and bridges of many types. A large panoramic picture of the San Francisco Bay Bridge, the construction of which is soon to be begun under the direction of State Highway Engineer C. H. Purcell, elicited much interest and offered an opportunity of the exhibit attendant to dispense an almost continuous lecture on that huge enterprise.

HIGHWAY SECTIONS SHOWN

One of the features of the recent display was an exhibit showing in exact scale, samples of all standard types of State highways, built in cross section units. Revealing as it did, the progressive steps of placing materials, it proved most interesting and educative to hundreds of visitors whose prior knowledge of the anatomy of our highways was limited to what they could see over the steering-wheel. This excellent exhibit was prepared by the staff of the Highway Test and Research Laboratory.

A part of the Department of Public Works' display will be consigned to the World Fair Commission, at their request, for exhibition at the Century of Progress Exposition to be held in Chicago next year.



STUDYING THEIR CALIFORNIA, these visitors to the State Fair gathered about the huge relief map of the State that formed the central feature of the large exhibit of the Department of Public Works in the Western States Building. Showing plainly all the rivers, lakes, mountains, towns and highways of the State, each marked by name, this great map was constantly surrounded by a crowd of folks, old and young, all keenly interested in identifying familiar highways and places and obtaining graphic knowledge of the location and relative position of other places and roads that attracted their attention.



HIGHWAY ANATOMY at a glance was revealed to the layman in this corner of the department's exhibit. In the showcase were displayed cross-sections of standard types of highway construction showing the progressive steps in placing materials from the foundation to the top surface.

Soil Test Values in Subgrade Studies

(Continued from page 17)

California Highways in 1920 so far as relating to subgrades adopted the following as the three principle tests:

- (a) Soil moisture determination.
- (b) Moisture equivalent determination.
- (c) Contraction or shrinkage measurement.

The relation of Moisture Content to bearing power was brought out in this study, and also values of Moisture Equivalent together with certain studies showing the lines of equal Moisture Content as found in subgrade in certain parts of the State.

It was not thought desirable to repeat the experiments of the Bureau in our determinations for the reason that it seemed possible to combine their results with ours. Soil samples were, however, preserved at the laboratory so that any tests desired might be made later if deemed necessary.

SAMPLING METHODS

The number of samples taken in our examination in 1923 was very much less than the number taken by the Bureau of Public Roads, as we felt unable to distinguish by visual inspection the different types of soil. The general method pursued was to take a sample of soil at intervals of about two miles or at shorter intervals wherever there seemed to be a change in the appearance of the soil. If this change was over a distance of only a few hundred feet no sample was taken.

The samples were taken from under the edge of the pavement with pick and shovel and a check sample was taken from the soil within the right of way which could be examined after having been used in the construction of the subgrade. Samples were placed in small canvas sacks for shipping to the Testing and Research Laboratory. Where the pavement was especially bad, soil samples were taken by boring under the pavement with a 2-inch soil auger. Such samples were immediately placed in air-tight cans to preserve the moisture content.

HIGHWAYS COVERED

Roughly speaking, the scope of the examination covered the following highways:

- Coast Route, from Healdsburg to San Diego.
- Valley Route, from Chico to Los Angeles.
- Valley Route, from Tehama to Davis.
- Lateral Route from Sacramento to San Jose by way of Vallejo and Oakland.
- Lateral Route from Tracy to Oakland.

Over certain limits of highway, sampling was omitted either because the highway was paved with other material than Portland cement concrete or for the reason that the highway had been reconstructed, with either second story work or asphaltic concrete surface and was, therefore, considered in a practically permanent condition for the present.

The soils were classified in accordance with their popular names and also in accordance with the names given by the U. S. Bureau of Soils.

It was hoped to be able to secure a classification relating to the characteristics of the soil rather than any arbitrary name, but the investigation lapsed

before it was possible to establish the relationships of various characteristics of the soil in such a manner as to work out a proper classification index.

LABORATORY STUDIES

In general, laboratory studies on the soil samples, were based on the methods devised by Boyd, Proceedings, A. S. T. M., Vol. 22, 1922, and consisted of the following determinations:

- | | |
|---------------------------------|--------------------|
| 1. Mechanical analysis of soil. | 5. Shrinkage. |
| 2. Vertical capillarity. | 6. Dye absorption. |
| 3. Water holding capacity. | 7. Sand content. |
| 4. Bearing power. | 8. Clay content. |
| | 9. Silt content. |

The study of the above nine characteristics required a great deal of labor and time, and in view of the information already had by other investigators, it was decided to eliminate determinations of the following matters.

10. Moisture index.
11. Moisture equivalent, as determined by the Boyd method and also by the method devised by Rose and McKesson.
12. Slaking ratio of soils as devised by the Illinois Highway Commission.

The results of many of the 1924 studies indicated that for all practical purposes in highway construction a large number of tests might be eliminated, but such as were approved have been in use until the present time and have been a useful guide to further progress in the interesting study of subgrade soils.

Highway Work Filmed

A six-reel motion picture in sound, scored to music by the Marine Band, has been released by the U. S. Department of Agriculture, reports the California State Automobile Association. The film shows the extent of the highway system in the United States, highway construction methods, and highway engineering activities. It is loaned by the Office of Motion Pictures, Department of Agriculture, Washington, D. C.

The Go-Go Tree

Under the spreading Go-Go tree
The traffic policeman stands,
While cars of low and high degree
Obey his stern commands.

Rastus: "Dis yer flying business is a mighty old venture."

Mose: "How does you mak dat out?"

Rastus: "Cause I'se heah dat pastor say in church Sunday Esau sold his heirship to Jacob."

—Borrow Pit

If you don't know what happens when the irresistible force meets the irresistible body, here is what happens: They start to fuss and argue, cuss and discuss, over the right-of-way and what not, and simply hold up the rest of traffic for 30 minutes.—*Texas Highways*

Dublin Canyon Link to be Given Cement Concrete Pavement

(Continued from page 14)

This alternate highway follows the canyons and narrow gorges which lie westerly of the Ridge and leaves the existing highway at Castaie School, connecting with it again at Tejon Pass. It will shorten the distance across the mountains by nearly ten miles and will be a great improvement to line and grade.

IMPROVING LATERAL

Further improvement to the heavily traveled Oakland-Stockton lateral is planned for commencement this month with the placing of a 30-foot Portland cement concrete pavement on the roadbed which was constructed four years ago through Dublin Canyon. This new pavement will connect at its westerly end with the pavement between Castro Hill and Stanton Avenue, a contract for which was awarded on August 5th, and at its easterly end with the existing pavement in the town of Dublin. Fifteen per cent of the traffic over this section of State highway is heavy trucking, and it is imperative that a permanent pavement of ample width be provided to care for travel on this important lateral which connects the bay area with the San Joaquin Valley.

On the Bay Shore Highway, it was planned to construct a graded roadbed and place a bituminous treated crushed rock surface between Oregon Avenue, in Palo Alto, and the Lawrence Station Road, in Santa Clara County. But with the additional emergency relief funds now available, it is found to be possible to finance the placing of the permanent Portland cement concrete pavement. To secure the maximum Federal aid, the project has been divided; and the first portion will be advertised this month.

MARKS ANOTHER ADVANCE

This section will involve the construction of a graded roadbed 60 feet wide and the placing of a 40-foot pavement between Oregon Avenue and Whisman Road, a distance of 4.7 miles. This revised project will carry this new and modern boulevard on down the peninsula and will mark another step towards its completion when it will connect San Francisco and San Jose.

An important improvement to the Oxnard-Serra highway, where it skirts the Pacific along the base of the high bluffs between

BROKE DOWN IN DESERT; ROAD MEN TO RESCUE

Mr. E. Q. Sullivan,
District Engineer,
San Bernardino.
Dear Sir:

On June 16th I with two of my sisters was returning from Blythe and when about 10 miles west of Desert Center our car suddenly stopped for no apparent reason. A short time later two of your men came along, Messrs. J. Von Rader, and Joe Smith, and very kindly tried to assist us by attempting to locate the trouble. It was certainly no fault of theirs that they were unable to do so, as after we had been towed into Coachella it was found that the gas line had been jarred loose from the channel of the frame and mashed between the spring shackle and the housing. This freak accident was naturally difficult to locate, but had the trouble been anything ordinarily encountered I am confident they would soon have had it repaired as they appeared to be very competent, and certainly very kind and courteous. It is indeed gratifying to find such kindness and helpfulness in the employees of our highway department as it was a terrifying experience to be stalled on the desert with no help within walking distance. I therefore wish to commend these two gentlemen most highly and express to you my gratitude for their help.

Very sincerely yours,

ELIZABETH G. WILDES,
Burbank, California.

Editor's Note.—On our desert highways men of the road crews are trained to render aid to all persons who are in serious trouble.

Santa Monica and Point Mugu, in Los Angeles County, will be the construction of a new bridge across Topanga Creek. This new structure will be a two span reinforced concrete slab 78 feet long. It will provide a clear roadway 76 feet wide and two five-foot sidewalks. The structure will alleviate traffic congestion at the present narrow bridge which only admits of two lanes of traffic.

A further step in the construction of the new alignment of the Redwood Highway between Cloverdale and Hopland, in Mendocino County, will be set in motion with the advertising of the 241-foot timber bridge across the Squaw Rock Slide which lies across the Russian River from the high promontory known as Squaw Rock.

Construction of this new section of the scenic Redwood Highway is progressing, and its completion will obviate the necessity of motorists, traveling this famous recreational highway, traversing the steep and tortuous grade of the existing road and provide a clear roadway width of 34 feet.

Highway Bids and Awards for August

ALAMEDA COUNTY—2.4 miles to be graded and paved with Portland cement concrete between Castro Hill and Stanton Ave. Dist. IV, Rt. 5, Sec. B. Granite Construction Company, Watsonville, \$118,465; Peninsula Paving Co., San Francisco, \$124,948; United Concrete Pipe Corp., Los Angeles, \$119,302; Clyde W. Wood, Stockton, \$112,627; M. J. Bevanda, Stockton, \$114,434; Heafey-Moore Co., Oakland, \$120,896; N. M. Ball & D. McDonald, Sacramento, \$116,878; Hanrahan Company, San Francisco, \$116,271; Bundesen & Lauritzen & Delta Dredging Company, Pittsburg, \$124,459; Eaton & Smith, San Francisco, \$134,954; Union Paving Company, San Francisco, \$118,981. Contract awarded to Fredrickson & Watson, Oakland, \$109,318.

CALAVERAS COUNTY—Property fences to be constructed at Altaville Maintenance Station. Dist. X, Rt. 65, Sec. B. Edwin B. Bishop, Sacramento, \$1,011; Michell & Pfeffen, San Francisco, \$1,132; Calif. Wire Cloth Co., Oakland, \$1,075; Kamian Fence Co., San Francisco, \$870; Anchor Post Fence Co., San Francisco, \$855. Contract awarded to Standard Fence Co., Oakland, \$731.

IMPERIAL COUNTY—About 7.9 miles to be graded and paved with asphalt concrete between Sand Hills and Araz Junction. Dist. VIII, Rt. 27, Sec. B. Fredrickson & Watson Construction, Oakland, \$324,343; Oswald Bros., Los Angeles, \$306,129; Daley Corporation, San Diego, \$332,380; Griffith Company, Los Angeles, \$304,986; Peninsula Paving Company, San Francisco, \$294,537; R. E. Hazard Contracting Co., San Diego, \$288,916. Contract awarded to V. R. Dennis Construction, San Diego, \$287,725.

LAKE-COLUSA COUNTIES—18.9 miles surfacing with bituminous treatment between Abbott Mine and 5 miles west of Williams. Dist. III, Rt. 15, Sec. C.D. & E. United Contracting Co., Portland, Oregon, \$16,439; Fred W. Neighbert, Bakersfield, \$17,050; Heafey-Moore, Oakland, \$16,262; Hemstreet & Bell, Marysville, \$15,445; Oilfields Trucking Co., Taft, \$17,578; Pacific Truck Service, Inc., San Jose, \$18,577; Skeels & Graham, Roseville, \$16,577; S. M. McGaw, Stockton, \$15,745; J. O'Shea, Inc., San Francisco, \$17,438; A. Teichert & Son, Sacramento, \$16,271; Helwig Construction Co., Sebastopol, \$15,000; L. G. Kipp, Sacramento, \$14,375; Geo. French, Jr., Stockton, \$15,697. Contract awarded to Clyde W. Wood, Stockton, \$13,715.

LOS ANGELES COUNTY—14.5 miles to be paved with Portland cement concrete between Castaic School and Piru Creek. Dist. VII, Rt. 4, Sec. A.G.H. & I. Fredrickson & Watson Const. Co., Oakland, \$462,125; Will F. Peck Co., Los Angeles, \$416,634; J. E. Haddock, Ltd., Pasadena, \$459,720; Peninsula Paving Co., San Francisco, \$426,430; M. J. Bevanda, Stockton, \$504,812; Sander Pearson & Oberg Bros., Los Angeles, \$485,632; Union Paving Co., San Francisco, \$474,420; Clyde W. Wood, Stockton, \$424,800; Harnahan Co., San Francisco, \$443,070; J. L. McClain, Los Angeles, \$434,009; Griffith Company, Los Angeles, \$439,333; United Concrete Pipe Co., Los Angeles, \$458,067. Contract awarded to Jahn & Bressi Co., Los Angeles, \$379,820.

LOS ANGELES COUNTY—6.2 miles to be paved with Portland cement concrete between Brea Canyon and Pomona. Dist. VII, Rt. 19, Sec. E. Jahn & Bressi, Los Angeles, \$240,706; Mittry Bros. Const., Los Angeles, \$290,861; United Concrete Pipe Corp., Los Angeles, \$269,520; T. M. Morgan Paving Co., Los Angeles, \$276,661; Peninsula Paving Co., & J. P. Holland, Inc., San Francisco, \$240,473; J. L. McClain, Los Angeles, \$248,398; Sharp & Fellows, Los Angeles, \$249,790; J. E. Haddock, Ltd., Pasadena, \$258,432; Von der Hellen & Pierson, Castaic, \$269,674. Contract awarded to Griffith Company, Los Angeles, \$227,985.

MARIN COUNTY—Portions to be surfaced with bituminous treated crushed gravel or stone between Novato and Ignacio, about 2.2 miles. Dist. IV, Rt. 1, Sec. A. Heafey-Moore Co., Oakland, \$4,347; W. H. Larson, Berkeley, \$5,160. Contract awarded to P. S. Harless, San Rafael, \$3,225.

MARIN COUNTY—Furnishing and placing bituminous surfacing treatment between Alto and Waldo—3 miles. Dist. IV, Rt. 1, Sec. C. Heafey-Moore Co.,

Oakland, \$1,050; Oilfields Trucking Co., Taft, \$15,218; S. M. McGaw, Stockton, \$10,490; C. W. Wood, Stockton, \$10,860; Highway Builders, Ltd., San Anselmo, \$11,220; Peninsula Paving Co., San Francisco, \$9,770; A. J. Ralsch Co., San Francisco, \$10,279; Helwig Construction Co., Sebastopol, \$9,646. Contract awarded to Hutchinson Co., Oakland, \$7,776.

MARIN COUNTY—About 3.1 miles to be surfaced with bituminous treated crushed gravel or stone between Alto and Belvedere Crossing. Dist. IV, Rt. 52, Sec. A. Highway Builders, Ltd., San Anselmo, \$19,466; Pacific States Const. Co., San Francisco, \$17,970; W. H. Larson, Berkeley, \$21,580; A. J. Ralsch Co., San Francisco, \$18,398; Helwig Const. Co., Sebastopol, \$18,037; C. W. Wood, Stockton, \$16,962; Peninsula Paving Co., San Francisco, \$18,822; Heafey-Moore Co., Oakland, \$19,639. Contract awarded to Hutchinson Co., Oakland, \$16,697.

MERCED COUNTY—Between 3.8 miles south of Merced and 4.2 miles north of Merced, 5.5 miles bituminous surfacing treatment on shoulders. Dist. VI, Rt. 4, Sec. A-C. Oilfields Trucking Co., Taft, \$6,243; Valley Paving & Construction Co., Fresno, \$7,143; A. Teichert & Son, Sacramento, \$7,438; Fred W. Neighbert, Santa Cruz, \$7,725. Contract awarded to Tiffany-McReynolds-Tiffany, San Jose, \$4,812.

MERCED COUNTY—Bridge across Merced River 1.4 miles north of Livingston, consisting of 3 77-foot deck plate girder spans on concrete piers with pile foundation, 23 44½-foot steel beam spans on concrete pile bents. Dist. VI, Rt. 4, Sec. D. Healy-Tibbitts Const. Co., San Francisco, \$138,757; M. B. McGowan, Inc., San Francisco, \$120,869; Porter Bros., Corp., San Francisco, \$131,991; Mittry Bros., Const. Co., Los Angeles, \$110,733; Oberg Bros., Los Angeles, \$115,691; Gist & Bell, Arcadia, \$111,952; Sharp & Fellows Const. Co., Los Angeles, \$111,571; Bodenhamer Const. Co., Oakland, \$113,923; Fredrickson & Watson, Oakland, \$100,994; Lord & Bishop, Sacramento, \$104,338. Contract awarded to Rocca & Caletti, San Rafael, \$99,853.

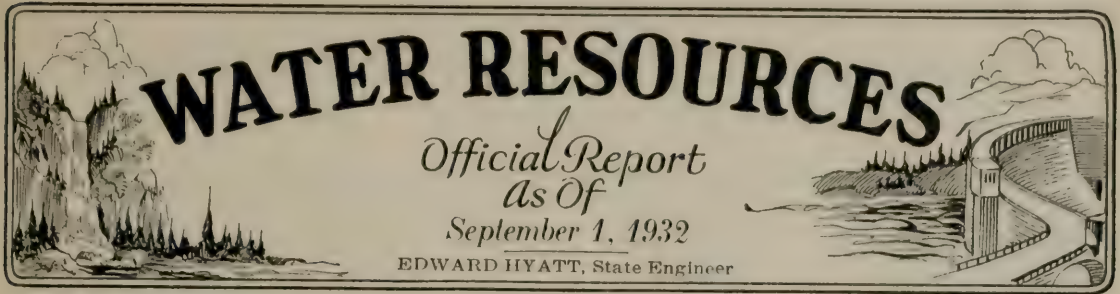
MONTEREY COUNTY—In Monterey County at Willow Springs, about 28 miles north of San Simeon constructing a standard truck shed, gasoline house and septic tank and leaching field. Dist. V. Jones and Turner, Santa Maria, \$4,571; Theo. Maino, San Luis Obispo, \$5,060; F. Marion Smith, San Luis Obispo, \$5,627; Daniels Bros., Cambria, \$5,120. Contract awarded to Theodor Johanns, San Francisco, \$4,488.

NAPA COUNTY—Furnish and place rock borders bituminous treated road mix method between Sonoma-Napa County line and Napa, and between Napa Wye and Napa-Solano County line about 11.9 miles. Dist. IV, Rts. 8 and 74, Sec. A. Heafey-Moore Co., Oakland, \$5,459; Lee J. Immel, Berkeley, \$5,684; J. R. Reeves, Sacramento, \$1,362; Helwig Const. Co., Sebastopol, \$9,460. Contract awarded to C. W. Wood, Stockton, \$4,750.

NEVADA COUNTY—11.7 miles to be surfaced with untreated crushed gravel and bituminous surface treatment applied, between Nevada City and 1 mile west of Washington Road. Dist. III, Rt. 15, Sec. C. Fredrickson & Watson Const., Oakland, \$34,565; Granite Const. Co., Watsonville, \$38,406; Hemstreet & Bell, Marysville, \$31,000; Clyde W. Wood, Stockton, \$35,810; Skeels & Graham Co., Roseville, \$32,377; Peninsula Paving Co., San Francisco, \$37,820; Heafey-Moore Co., Oakland, \$36,084; Geo. French, Jr., & Hein Bros. Basalt Rock Co., Stockton, \$38,770; E. B. Bishop, Sacramento, \$31,520; Eaton & Smith, San Francisco, \$38,030. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$30,978.

SAN BERNARDINO COUNTY—24.7 miles of shoulders to be treated with fuel oil between Los Angeles County line and San Bernardino, and between San Bernardino and Anderson St. Dist. VIII, Rts. 9 and 26, Secs. A.B.C.D. & A. Kemper Construction Co., Ltd., \$20,493; Oilfields Trucking Co., Taft, \$30,299; Miracle Co., San Diego, \$20,383; Martin Bros. Trucking Co., Long Beach, \$20,052; P. J. Akmadzich, Los Angeles, \$20,273; Southwest Paving Co., \$18,950; Edwin G. Bowen Co., Ltd., Los Angeles, \$22,036; C. W. Wood, Stockton, \$20,934; H. E. Cox & Son, Pasadena, \$20,934; L. A. Paving Co., Los

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The Federal government has appropriated \$150,000 for the repair and maintenance of the protective levees of the Palo Verde Irrigation District along the Colorado River in Riverside County. Seventy-five thousand dollars of the appropriation is immediately available and work is planned to begin in October. The Palo Verde district is contemplating an agreement with its bondholders, whereby the latter, through the acquisition and disposal of lands acquired by the district through tax sales, will cancel their bonds.

Other news from the irrigation districts, the beginning of salinity encroachment in the San Joaquin-Sacramento Delta region and details of dam investigations, reclamation and flood control projects are given in the report of State Engineer Hyatt for the month of August as follows:

Through an agreement with the city of San Diego, the La Mesa, Lemon Grove and Spring Valley Irrigation districts will have joint use of the El Capitan Dam, now under construction on the San Diego River.

Paradise Irrigation District, Butte County, reported a greater amount of water in storage on August first than had ever before been recorded at so late a date in the season.

The Corcoran Irrigation District, Kings County, proposes to augment its gravity water supply by the purchase of an additional share in the Peoples Ditch Company, diverting from Kings River.

REFINANCING PLAN

The Lindsay-Strathmore Irrigation District, Tulare County, has recently acquired an additional 307 shares in the Consolidated Peoples Ditch Company, diverting from the Kaweah River, giving the district a total holding of 1500 shares, or approximately one-sixth of the capital stock of the company.

Under a proposed refinancing plan the Palmdale Irrigation District, Los Angeles County, contemplates the expenditure of approximately \$200,000 in additions and betterments to its irrigation system.

The Nevada Irrigation District, Nevada County, is expending \$62,000 in additional construction on its mountain division.

The California Districts Securities Commission held its August meeting on August 12th. In the absence of Attorney General Webb, State Engineer Hyatt presided. Reports were presented by the Executive Secretary on the condition of several irrigation dis-

tricts which are in financial difficulty. The conditions presented were discussed, but due to the absence of two of the members of the Commission official action on these and other matters of refinancing was deferred.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The maintenance headquarters at Sutter City has been practically completed and the activities have been reduced to routine. A power grindstone has been installed for sharpening of axes and brush hooks used in brush clearing operations.

The irrigation of willows planted along the East levee of the Sutter By-pass for protection has been continued, and some additional willows are being planted. Repairs are being made to several of the timber bridges in the by-pass and plans are being made for major repairs on two of the bridges. This work will consist principally of replacing timber pile bents. The piles supporting a number of the bridges constructed in 1924 are showing an unusually rapid rate of deterioration.

Plans are now being made to commence about September 10th maintenance brush clearing work in the by-pass. This is largely hand work and will provide employment for approximately sixty-five men for a period of three months. The 1200 goats pastured in the lower Sutter By-pass are still doing excellent work in keeping down the growth of the young willows.

Sacramento Flood Control Project—Bank Protection.

In cooperation with Reclamation District No. 1500, approximately 200 feet of river bank will be protected with brush mat. The location of this work is on the left bank of the Sacramento River about four miles downstream from Knights Landing, at the Ely ranch. Work will commence on August 22d.

Details regarding the proposed program of permanent bank protection in cooperation with the Federal Government are now being worked out. One employee of this division has been engaged since August 12th in the office of the California Debris Commission on this work. During this period several trips were made by launch with Government officials for the purpose of inspecting the condition of the river banks.

Russian River Jetty.

Eleven men have been employed on the jetty construction work. The track connection between the old timber wall and the new steel trestle is practically completed and will be in service within a few days.

Delta Salinity Encroachment Begun

(Continued from page 29)

During one week of this period 92 cars of rock containing 900 tons were placed in the jetty, at a labor cost of 44 cents per ton. A number of the rock cars are now being repaired.

Emergency Flood Protection and Rectification of Rivers.

Arrangements are being made for carrying out a small job of bank protection on the Mad River in Humboldt County, in cooperation with the land-owners.

WATER RIGHTS

Applications to Appropriate.

Twenty-six applications to appropriate water were received during the month of July. Twelve were denied and 20 were approved. In the same period 7 permits were revoked and 8 passed to license.

ADJUDICATIONS

Shasta River (Siskiyou County). Findings in accordance with the decision of the court are being prepared by the Division.

Whitewater River (San Bernardino and Riverside counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

Oak Run Creek (Shasta County). The case of F. A. Colby et al., vs. L. O. Strayer et al., referred to the Division by the Superior Court of Shasta County by an order dated April 25, 1923, and involving an adjudication of the water rights on Oak Run Creek, was terminated by a court decree entered on July 22, 1932. The decree adjudicates water rights to the extent of 5.40 cubic feet per second, for the irrigation of 303 acres of land. The water rights defined are appurtenant to 11 ranches, which are served by 7 ditches.

Clover Creek (Shasta County). The Division submitted a supplemental report as referee on August 1, 1932.

Butte Creek (Siskiyou County). Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Deep Creek (Modoc County). The schedule of allotments adopted by the water users for trial distribution during the 1932 irrigation season was administered by a water master throughout the month.

Franklin Creek (Modoc County). The schedule of allotments for trial distribution for the 1932 irrigation season was administered by a water master throughout the month.

Eagle Creek (Modoc County). The waters of Eagle Creek were distributed throughout the month in accordance with the plan for trial distribution adopted for the 1932 irrigation season.

South Fork Pit River (Modoc County). Field work on the investigation of the water supply and use of water on the South Fork Pit River was continued throughout the month.

Cottonwood Creek (Modoc County). Field work on the investigation of the water supply and use of water on Cottonwood Creek was continued throughout the month.

Pine Creek in Surprise Valley (Modoc County). Field work on the investigation of the water supply and use of water on this stream system was continued throughout the month.

WATER DISTRIBUTION

Burney, Hat, North Cow, Oak Run and Clover creeks (Shasta County). Water master service on these streams was continued throughout the month.

Little Shasta River (Siskiyou County). Water master service on this stream was continued throughout the month.

West Fork of Carson River (Alpine County). Water master service on this stream for the 1932 season was started on August 10th.

Cedar, Davis, Deep, Eagle, Emerson, Franklin, Mill, New Pine, Owl, Pine and Soldier creeks and South Fork Pit River (Modoc County). Water master service on these streams was continued throughout the month.

Pit River in Big Valley (Modoc and Lassen counties). Supervision of diversions from Pit River in Big Valley and continued throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The field work comprising measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, has continued during the past month. On August 10th the flow of the Sacramento River at Sacramento had dropped to about 2000 second-feet and the San Joaquin River near Vernalis was flowing 1200 second-feet. According to past records, the minimum seasonal flow should have occurred by the middle of August and it is probable that the flow on August 10th as given represents closely the minimum seasonal flow to be expected. No water shortage for irrigation in the up-river areas has been reported and is not anticipated. In the Delta the seasonal encroachment of salinity has begun and salinity a little above 100 parts of chlorine per 100,000 parts of water is now in

Preparations Made for Snow Surveys

(Continued from preceding page)

the vicinity of Antioch and Collinsville at the lowest point of the Delta. It is not expected that the 100 part salinity encroachment will extend above Sherman Island during the present season. The following gives a comparison of the salinity at a few of the stations on August 10, 1932 and the corresponding salinity on August 10, 1931.

Station	Salinity in parts of chlorine per 100,000 parts of water	
	8/10/32	8/10/31
Point Orient-----	1620	1860
Point Davis-----	1240	1770
Bullshead-----	1120	1610
O. and A. Ferry-----	360*	1320
Collinsville-----	144*	1190
Antioch-----	104*	1050
Emmaton-----	12*	870
Jersey-----	12*	700
Central Landing-----	6	390
Middle River P. O.-----	5	130

* August 6th—latest available test.

During the last month the compilations for the 1931 report were completed and the report is now being mimeographed. This summarizes the water administration and conservation features of 1931 and presents all data and records obtained of stream flow, diversions, return flow, use of water, salinity, etc. It includes also a chapter on losses due to the water shortage and salinity in the 1931 season.

CALIFORNIA COOPERATIVE SNOW SURVEYS

Routine field and office work has continued under this project during the past month. A field trip was made to complete arrangements with the cooperating agencies for the Snow Mountain and Mt. Lassen surveys in the Pit and Feather River basins. A shelter cabin is to be built this summer on the route to the Mt. Lassen snow course in the Lassen Volcanic National Park. All courses in the South Yuba area were inspected and mapped and arrangements are being made for brushing out new growth on some of these courses.

DAMS

To date 812 applications have been received for approval of dams built prior to August 14, 1929; 96 for approval of plans for construction or enlargement and 357 for approval of plans for repair or alteration.

Five hundred nine Certificates of Approval of dams have been issued; 164 dams are under repair and 51 are under application for construction or enlargement.

In compliance with the law, orders have been issued on the remaining dams directing the work necessary to make them safe and fixing the time of completion.

Applications Received for Approval of Plans for Construction or Enlargement.

Dam	Owner	County
*Fallen Leaf	Anita M. Baldwin	El Dorado
**Williamson	Hector Williamson	El Dorado

* Reconstruction.

** Enlargement.

Applications Received for Approval of Plans for Repair or Alteration.

Fifty-four repair applications were received in this period in compliance with requests of the Department that work be done on dams before approval could be issued.

Plans were approved for construction of the Alta San Rafael Company dam on the Arroyo Seco in Los Angeles County.

Plans for repair or alteration were approved for 78 dams this month, this being the largest number which has been approved in a similar period.

The department is now entering upon a new phase of its work. Up to the present time a considerable portion of the time was consumed in investigating old dams. As a result of these investigations over 350 old dams out of a total of 700 have been, or are now being, repaired or altered in order to give them a reasonable factor of safety, which work requires regular and intensive inspection. Orders directing necessary work have been issued on 20 others. Upon the satisfactory completion of the necessary repair work the department will approve the dams, which does not, however, release the department from further continuing supervision on the grounds that having once approved these dams they are safe for all time without necessary maintenance. On the contrary, it is charged by law and by the dictates of engineering experience that constant supervision be kept over the maintenance and operation of these dams. Inspections must be made several times each year, depending on the nature of the dam and its location. As a certificate of approval of a dam is issued for the use as stated in the owners application, it is necessary in the interests of safety to see that the dam is operated in this manner. Should, for example, the spillway of an earth dam be blocked up by flashboards or earth to a point where the necessary freeboard is sacrificed, the dam may easily overtop and a partial or complete failure of the structure result. Nor are structures immune to the effects of the elements and adverse load conditions; they, as well as their abutments and foundation, must be regularly observed, particularly for the effects of overpour after the passage of floods.

For these reasons the law governing the supervision of dams provides for continued supervision over the maintenance and operation of all existing dams and it is this phase of activity upon which the Department is now entering, in addition to regular and competent inspection of an extensive construction and enlargement program, particularly in the southern part of the State.

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties). Work on the report covering the three years investigation of the Pit River has been continued during the present month.

Napa Valley Investigation. Assembly of the final report of the Napa Valley investigation is in progress.

(Continued on page 32)

Many Roadside Slopes to be Planted

(Continued from page 2)

Slope protection.

From San Luis Obispo south along the Coastal Road to Santa Barbara on Route 1, permanent sections of Route 12 east of San Diego, permanent sections of Route 9 on the Foothill Boulevard and cut slopes near Huntington Beach on Route 1, have been planted to Mesembryanthemum or Ice Plant.

It has been found, as a general rule, that planting on the face of the cut slope is not advisable because of the sterility of the soil and also that pockets formed by planting serve as catch basins for water and induce erosion. By confining the planting to the top of the cut where fertile soil exists best results have been obtained. On fill slopes the entire surface should be planted and in the case of poor soil, its growth will be greatly aided by the application of top soil in pockets or as a cover.

ALONG THE COAST

Upon completion of the reconstruction along the coast it is intended to plant the slopes. The Roosevelt Highway from Newport to San Diego, a portion along the Malibu and the Whittier Boulevard will soon be under way.

The Gaviota Canyon slopes on Route 1, south of Buellton, will be planted this fall to native shrubs, such as toyons, mountain lilac, California laurel, etc. This work might be classed as restoration as well as protection, and will greatly enhance this beautiful drive.

Tree planting.

From the Kern County line south to Bakersfield a Chinese Elm planting was sponsored by Kern County. These trees have grown exceptionally well. A mulch of cotton boles proved very satisfactory in preserving the moisture. This variety of tree is particularly suited to the dry arid climate of the San Joaquin Valley.

TRIPLE EXPERIMENT

In order to determine the suitability and cost of maintenance of Palo Verde trees in the Imperial Valley, three experimental sections were selected differing in soil conditions and an alternate planting of the native Palo Verde (*Cercidium torreyanum*) and the exotic Jerusalem Thorn (*Parkensonia aculeata*) which is more dense in its habit of growth than the Palo Verde with beautiful yellow blossoms, was made.

This last variety has so far proven itself to be superior to the native Palo Verde. Each planting is charted and the trees are given different amounts of water to determine their actual requirements.

Eucalyptus trees were planted along the base of the fill west of Yuma to serve as a protection to the road in time of flood. Eucalyptus, especially the variety "rostrata" do very well under Imperial Valley conditions if water is available for them. All roadside trees planted there must always be watered unless the proximity of a well irrigated field or ditch afford them continual moisture.

POPLARS THRIVE

A group planting of palms was made on Route 26 from San Bernardino to Redlands. A portion of this road was grouped to poplar trees that are also doing excellently. They have since been interplanted with weeping willow trees as the water table is high in this section, offering a rare opportunity for a planting of this kind.

The cost on this work has been very small, the palms being raised as a spare time job and the willows planted by cuttings.

Palm groups are being planted also south of Indio between the highway and railroad, in an area irrigated by drainage.

Several hundred native trees indigenous to mountain conditions have been planted along the Crest Drive from San Bernardino to Big Bear Lake. They have been placed so as to eventually screen or frame some view. These trees were presented to the State and have received no maintenance other than protection.

SEPTEMBER WATER RESOURCES

(Continued from page 31)

Santa Clara Investigation. Computation of the miscellaneous stream flow measurements made during the past winter and spring is in progress.

South Coastal, Ventura, Salinas Valley and Mojave River Investigations. Progress is being made and work is proceeding along routine lines in the South Coastal Basin, Ventura County, Salinas Valley and Mojave River investigations.

STATE WATER PLAN

Arrangements were made for representatives of the State of California to accompany the U. S. Senate Committee on Irrigation and Reclamation in making the investigation of the Great Central Valley Project of the State Water Plan of California. This investigation was authorized by Senate Resolution No. 177, 72d Congress, 1st Session, to investigate the plan for the development of the water resources of the Great Central Valley of California as outlined in U. S. House of Representatives Document No. 791, 71st Congress 3d Session. That document is a report by the U. S. War Department in accord with the outline of investigations proposed in House Document No. 308 and with the directions contained in Section 3 of the River and Harbor Act, March 3, 1925. The physical plan presented in the document is in substantial agreement with that recommended by the State after ten years of investigation and study.

Sophomore: I thought you weren't coming back to college next term.

Junior: I know, but a few weeks ago I heard father say there was a fine opening in the business.

August Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources during the month of August, 1932.

LOS ANGELES COUNTY—Application 7335. S. A. McNeil, Los Angeles, for .25 c.f.s. from Fallen Oak Canyon tributary to Mint Canyon and Santa Clara River to be diverted in Secs. 9 and 10, T. 5 N., R. 14 W., S. B. B. and M. For irrigation and domestic purposes on 20 acres of land. Estimated cost \$350.

PLACER COUNTY—Application 7336. F. M. Chrisman 1023 Russ Building, San Francisco, for 250 c.f.s. 200,000 acre-feet per annum from Middle Fork of American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For municipal purposes in Sacramento and surrounding territory. Estimated cost \$15,000,000.

PLACER COUNTY—Application 7337. F. M. Chrisman, 1023 Russ Building, San Francisco, for 250 c.f.s. 200,000 acre-feet per annum from Middle Fork American River tributary to Sacramento River to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For power purposes. Estimated cost \$18,000,000.

MARIPOSA COUNTY—Application 7338. John C. McGarry, Incline, .22 c.f.s. from Cranberry Gulch tributary to Merced River to be diverted in Sec. 22, T. 3 S., R. 19 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$400.

SANTA BARBARA COUNTY—Application 7339. Mary Kinevan, Santa Barbara, for 8000 gallons per day from unnamed spring tributary to Santa Ynez River to be diverted in Sec. 18, T. 5 N., R. 28 W., S. B. M. For irrigation and domestic purposes on 5 acres. Estimated cost \$600.

EL DORADO COUNTY—Application 7340. R. A. Easley, Antioch, for 200 gallons per day from an unnamed spring tributary to South Fork American River to be diverted in Sec. 24, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

EL DORADO COUNTY—Application 7341. L. W. Mehaffey, Antioch, for 200 gallons per day from an unnamed spring tributary to South Fork American River to be diverted in Sec. 24, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

SISKIYOU COUNTY—Application 7342. George Steiner and Jack R. O'Donovan, Happy Camp, for 1 c.f.s. from Cole Creek tributary to South Fork Indian Creek to be diverted in Sec. 10, T. 17 N., R. 6 E., H. M. For mining purposes.

SISKIYOU COUNTY—Application 7343. Edward C. Baker, Happy Camp, for 1 c.f.s. from West Branch Indian Creek tributary to Indian Creek to be diverted in Sec. 23, T. 18 N., R. 6 E., H. M. For mining and domestic purposes. Estimated cost \$75.

SANTA CLARA COUNTY—Application 7344. Santa Clara Valley Water Conservation District, San Jose, for 25 c.f.s. from Stevens Creek tributary to San Francisco Bay to be diverted in Sec. 10, T. 7 S., R. 2 E., M. D. For well replenishment for northern end of Santa Clara Valley.

EL DORADO COUNTY—Application 7345. B. W. Stone, 161 Ellis Street, San Francisco, for 500 c.f.s. 125,000 acre-feet per annum, from Rubicon River, Pilot Creek, Gerle Creek, Loon Lake, Buck Island Lake, Rock Bound Lake and Little South Fork of Rubicon River tributary to American River to be diverted in Sec. 9, T. 13 N., R. 16 E.; Sec. 11, T. 12 N., R. 12 E.; Sec. 24, T. 13 N., R. 12 E.; Secs. 11, 31, 34, T. 14 N., R. 14 E.; Sec. 4, T. 13 N., R. 15 E.; and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

EL DORADO COUNTY—Application 7346. C. M. Carter, R. D. Nicol, and W. P. Austin, Oakland, for 100,000 acre-feet per annum, from South Fork American River tributary to Sacramento River to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. M. For municipal purposes.

EL DORADO COUNTY—Application 7347. C. M. Carter, R. D. Nicol, and W. P. Austin, Oakland, for 614,000 acre-feet per annum from South Fork American River tributary to Sacramento River to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. M. For irrigation purposes on 450,000 acres. Estimated cost \$9,000,000.

SIERRA COUNTY—Application 7348. C. E. Brewer, Downville, for 3 c.f.s. from Newhouse Creek tributary to South Fork of North Fork Yuba River to be diverted in Sec. 32, T. 20 N., R. 11 E., M. D. M. For mining purposes. Estimated cost \$500.

MONO COUNTY—Application 7349. Mrs. Frankie M. Beatty, Bishop, for 200 gallons per day from an unnamed stream tributary to Rock Creek and Owens River to be diverted in Sec. 19, T. 5 S., R. 30 E., M. D. M. For domestic purposes. Estimated cost \$50.

PLACER COUNTY—Application 7350. Canie A. Gladding, Lincoln, for 3 c.f.s. 199 acre-feet per annum from Coon Creek tributary to Feather River to be diverted in Secs. 21 and 22, T. 13 N., R. 6 E., M. D. B. and M. For irrigation and domestic purposes on 750 acres. Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Application 7351. E. P. Woodward, 2326 W. Avenue 31, Los Angeles, for 1/16 c.f.s. from 5 unnamed springs to be diverted in Secs. 17, 20, 21 and 22, T. 2 N., R. 3 E., S. B. B. and M. For mining purposes.

SISKIYOU COUNTY—Application 7352. Ainsworth Consolidated Mining Company, 303 Commerce Building, Portland, Oregon, for (1) 0.5, (2) 1.5 or 2.0 c.f.s. from Grouse Creek (at points 1 and 2) tributary to East Fork Scott River to be diverted in Sec. 22, T. 40 N., R. 7 W., M. D. B. and M. For mining purposes. Estimated cost \$500.

SAN BERNARDINO COUNTY—Application 7353. Fred A. Steele, c/o F. M. Jackson, Manager, Bear Creek Lodge, San Bernardino, for 1370 gallons per day from Cameron Spring tributary to Bear Creek to be diverted in Sec. 21, T. 2 N., R. 1 W., S. B. B. and M. For recreational purposes.

MONO COUNTY—Application 7354. Mrs. Louise M. Green, 2446 E. Naomi Avenue, Arcadia, for 200 gallons per day from unnamed stream tributary to Twin Lakes, thence Mammoth Creek, Hot Creek and Owens River to be diverted in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes. Estimated cost \$50.

MONO COUNTY—Application 7355. Charles E. Day, Bridgeport, for 0.02 c.f.s. from Mono Lake Jim Spring tributary to Upper Twin Lake, thence Robinson Creek and E. Walker River to be diverted in Sec. 6, T. 3 N., R. 24 E., M. D. B. and M. For domestic purposes. Estimated cost \$300.

PLUMAS COUNTY—Application 7356. George McDonald, Box 343, Davis, for 3 c.f.s. from unnamed stream tributary to Rush Creek, thence E. Branch of North Fork Feather River, North Fork Feather River, Feather River and Sacramento River to be diverted in Sec. 13, T. 26 N., R. 8 E., M. D. B. and M. For mining purposes. Estimated cost \$500.

DEL NORTE COUNTY—Application 7357. A. L. Bailey, Agnes Bailey and W. S. Bailey, John J. Dann and H. A. Schell, c/o John J. Dann, 300 Henry Building, Portland, Oregon, for (1) 30.0, (2) 7.5, (3) 30.0 and (4) 7.5 or total 75.0 c.f.s. from (1) Left Fork Elk Creek, (2) unnamed branch of Left Fork Elk Creek, (3) North Fork of Left Fork Elk Creek and (4) Maple Gulch, tributary to (1) Elk Creek, thence W. Illinois River, (2) and (3) Left Fork Elk Creek and (4) Elk Creek, to be diverted in Secs. (1) 13 (2) 12 (3) 1, T. 18 N., R. 4 E., M. D. B. and M. and Sec. 36, T. 19 N., R. 4 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$13,000.

EL DORADO COUNTY—Application 7358. E. D. N. Lehe, Al Tahoe, for 600 acre-feet per annum from Star Lake tributary to Cold Creek to be diverted in Sec. 11, T. 12 N., R. 18 E., M. D. B. and M. For domestic purposes. Estimated cost \$3,000.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of August, 1932.

CONTRA COSTA COUNTY—Permit 3950, Application 7193. Bruno H. Gelbke, Concord, August 2, 1932, for 0.31 c.f.s. from Walnut Creek tributary to Suisun Bay in Sec. 2, T. 1 N., R. 2 W., M. D. B. and M. For domestic purposes and irrigation of 25 acres of orchard. Estimated cost \$1,000.

MONO COUNTY—Permit 3951, Application 7161. Herbert W. Ross, 713 Crescent Drive, Beverly Hills,

(Continued on next page)

Permits Given for the Appropriation of Water During August

(Continued from page 33)

August 4, 1932, for 200 g.p.d. from small stream tributary to Twin Lakes, thence Mammoth Creek, Hot Creek and Owens River in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes. Estimated cost \$39.

MONO COUNTY—Permit 3952, Application 7122. F. B. Balzar, Carson City, Nevada, August 10, 1932, for 200 g.p.d. from small unnamed stream tributary to Lower Twin Lake in Sec. 5, T. 3 N., R. 24 E., M. D. B. and M. For domestic purposes.

AMADOR COUNTY—Permit 3953, Application 7149. State of California, Department of Public Works, Division of Highways, District X, by C. H. Purcell, State Highway Engineer, Sacramento, August 13, 1932, for 0.016 c.f.s. from unnamed spring tributary to Bear River, thence North Fork Mokelumne River in Sec. 16, T. 9 N., R. 16 E., M. D. B. and M. For domestic and fire protection purposes. Estimated cost \$750.

ALPINE COUNTY—Permit 3954, Application 7276. State of California, Department of Public Works, Division of Highways, District X, by C. H. Purcell, State Highway Engineer, Sacramento, August 13, 1932, for 0.005 c.f.s. from unnamed spring tributary to West Fork Carson River in Sec. 31, T. 11 N., R. 19 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

CALAVERAS COUNTY—Permit 3955, Application 7166. State of California, Department of Public Works, Division of Highways, District X, by C. H. Purcell, State Highway Engineer, Sacramento, August 13, 1932, for 0.005 c.f.s. from Cottage Spring tributary to North Fork Stanislaus River in Sec. 28, T. 6 N., R. 16 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

LOS ANGELES COUNTY—Permit 3956, Application 7139. Division of Highways, Department of Public Works, State of California, Box 1103, Sacramento, August 13, 1932, for 0.03 c.f.s. from Whittacker Ridge Spring tributary to both Piru Creek and Canton Creek watersheds, thence Santa Clara River in Sec. 30, T. 6 N., R. 17 W., S. B. B. and M. For industrial and domestic purposes, State Highway construction and maintenance, support of shade trees, and for traveling public. Estimated cost \$1,500.

ALPINE COUNTY—Permit 3957, Application 7259. State of California, Department of Public Works, Division of Highways, District X, by C. H. Purcell, State Highway Engineer, Sacramento, August 13, 1932, for 0.005 c.f.s. from unnamed spring tributary to Kirkwood Creek, thence Cables Creek, thence Silver Fork of South Fork of American River in Sec. 22, T. 10 N., R. 17 E., M. D. B. and M. For recreational purposes. Estimated cost \$250.

HUMBOLDT COUNTY—Permit 3958, Application 7205. Vern Gephart, Weitchpec, August 15, 1932, for 2.00 c.f.s. from French Bar Gulch tributary to Klamath River in Sec. 21, T. 10 N., R. 5 E., H. B. and M. For mining purposes. Estimated cost \$200.

AMADOR COUNTY—Permit 3959, Application 7196. U. S. El Dorado National Forest, Placerville, August 15, 1932, for 0.017 c.f.s. from unnamed spring at head of Silver Fork tributary to Silver Fork, thence South Fork American River in Sec. 28, T. 10 N., R. 17 E., M. D. B. and M. For domestic purposes. Estimated cost \$600.

RIVERSIDE COUNTY—Permit 3960, Application 7258. Stuart D. and Sarah D. Allen, Box 28, Star Route, Redlands, August 20, 1932, for 0.50 c.f.s. from Whitewater River tributary to Salton Sink in Sec. 24, T. 3 S., R. 3 E., S. B. B. and M. For irrigation of 40 acres. Estimated cost \$2,000.

LOS ANGELES COUNTY—Permit 3961, Application 7215. U. S. Angeles National Forest, 501 Brownstein Building, Los Angeles, August 20, 1932, for 0.005 c.f.s. from Big Tujunga Ranger Station spring tributary to Big Tujunga River, thence Los Angeles River in Sec. 31, T. 3 N., R. 13 W., S. B. B. and M. For irrigation of one acre plantation of young forest trees, also domestic, recreational and fire fighting. Estimated cost \$150.

HUMBOLDT COUNTY—Permit 3962, Application 7240. Fred Brace, Orleans, August 20, 1932, for 2.00

(Continued on page 38)

Need for Federal Aid in State-Wide Plan Fully Demonstrated

(Continued from page 7)

hydroelectric power development, is in accord with established policies and precedents, and the interests and responsibilities of the Federal Government.

MEETS FEDERAL POLICY

10. Under the proposed plan of financing, the project is within the scope of the recently enacted Federal policy of loaning funds to publicly owned self-liquidating enterprises.

11. A liberal interpretation of Federal interests and responsibility in the project is justified as sound business judgment.

12. Finally, the Great Central Valley Project without question is economically sound and feasible if the Federal Government would provide financial assistance in accord with its justified interest and responsibility. With such assistance from the Federal Government, the analyses show that the proposed project is not a border line project as to economic feasibility but, on the other hand, one of unquestionable economic merit. It is believed that the Federal Government would be amply justified in extending financial assistance to the State of California for the construction of the Great Central Valley Project, in some combination of direct contributions and financing, which would assure the economic feasibility and successful consummation of the project.

At Long Beach, William Simpson, president of the Los Angeles Chamber of Commerce presided at the luncheon meeting. Lieutenant Governor Frank F. Merriam, Mayor Asa E. Fickling of Long Beach, and Rear Admiral H. H. Hough were the speakers.

WATER COMMISSIONERS SPEAK

Ben M. Maddux, president of the Tulare County Board of Trade was chairman of the Visalia meeting. Senator Frank W. Mixter, member of the California Joint Legislative Water Committee, James M. Burke, member of the Governor's Water Resources Commission, and Senator Robert D. Carey, of Wyoming, were the speakers.

At Fresno, A. B. Tarpey, member of the Governor's Water Resources Commission was in charge of the meeting. Commissioner Glass of the city of Fresno, Chester Warlow, chairman of the San Joaquin Valley Water Committee, Mr. Tarpey, and Senator Clarence C. Dill, of Washington, addressed the meeting.

At Merced, D. K. Barnell, member of the Governor's Water Resources Commission, presided and addressed the meeting. Senator Andrew R. Schottky, member of the Joint Legislative Water Committee, W. D. Wagner, secretary of the California Irrigation Districts Association, and Senator Henry E. Ashurst, of Arizona, spoke.

CRITTENDEN PRESIDED

Senator Bradford S. Crittenden, chairman of the Joint Legislative Water Committee presided at the Stockton meeting. Talks were made by Mayor Con. J. Franke, George A. Atherton, Manager of the Delta Farms, Inc., C. W. Schedler, Vice President of the

(Continued on next page)

Snow Tunnel Dug by Volunteer Crew to Open Mountain Road

WITH THE SNOW FURIES gathering for their annual onslaughts on the Sierra ramparts some record-breaking victories of last year won by State, county and community snow-fighting forces are recalled.

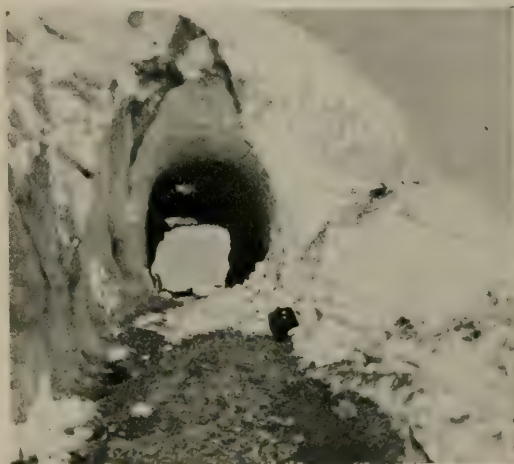
One memorable achievement was the Salmon Mountain Snow tunnel that opened the main Siskiyou County route to Sawyers Bar and the Salmon River mines in May, two months before the usual date. The worst section of this road was on the mountain ridge at an elevation of 7500 feet where the snow lay 12 feet deep. At one place was a huge drift 35 feet deep for a distance of 100 yards. Men and women volunteers from neighboring communities undertook the job of opening the road.

An open cut was made through the 12-foot depths until the big drift was encountered. They decided to tunnel through it and with 5 to 25 men working daily it required 161 man working days to shovel out a hole big enough to permit the passage of an automobile. While the men worked the women kept them supplied with hot food and drinks, and everyone worked without pay.

The tunnel was 100 yards long, 8 feet wide and 10 feet high and the whole operation, as a result of the hard and heroic work involved, proved a very satisfactory and efficient bit of community engineering.



VOLUNTEER WORKERS at mouth of tunnel.



HOLED OUT—Big drift 35 feet deep on road.

NEED FOR FEDERAL AID IN STATE-WIDE PLAN FULLY DEMONSTRATED

(Continued from preceding page)

Great Western Electro-Chemical Co. of Pittsburg, and W. B. Hogan, City Manager of Stockton.

H. J. Thielen, president, Chamber of Commerce, was in charge of the meeting at Sacramento. W. P. Dwyer, president of The River Lines, Stephen Downey, attorney, Colonel Thomas M. Robins, Division Engineer, Pacific Division, U. S. War Department, and Governor Rolph were the speakers.

At Red Bluff, Warren Woodson of Corning presided. Colonel Fred J. Robson, manager of the Stanford Ranch at Vina, A. T. Spencer, former member of the State Reclamation Board, and Senator Henry F. Ashurst spoke.

Orr M. Chenoweth was chairman of the meeting at Redding. Francis Carr, member of the Governor's Water Resources Commission, Norman B. Adkison, clerk of the Senate Committee, Senator elect John D. McCall, Colonel Walter E. Garrison, and Senator Robert Carey of Wyoming were the speakers.



SO BIG—but car fenders gradually widened it.

Vital Statistics on Dam Construction

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources during the month of August, 1932.

SIERRA COUNTY—Lower Gold Run Dam No. 297-2. Judson Estate Company and Heirs of Kingdon, San Francisco, owners; earth, 28 feet above streambed with a storage capacity of four acre-feet, situated on Gold Run, tributary to Slate Creek in Sec. 5, T. 20 N., R. 9 E., M. D. B. and M., for storage and diversion purposes for mining use.

Applications for approval of plans and specifications for construction or enlargement of dams filed with the State Department of Public Works, Division of Water Resources during the month of August, 1932.

EL DORADO COUNTY—Fallen Leaf Dam No. 461-2. Anita M. Baldwin, Los Angeles, owner; gravity, 9 feet above streambed with a storage capacity of 6400 acre-feet, situated on Taylor Creek, tributary to Lake Tahoe, in Sec. 2, T. 12 N., R. 17 E., M. D. B. and M., for storage and river purposes for power and recreation use. Estimated cost \$24,200.

EL DORADO COUNTY—Williamson Dam No. 464. Hector Williamson, Placerville, owner; earth, 41 feet above streambed with a storage capacity of 200 acre-feet, situated on a creek tributary to Webber Creek in Sec. 35, T. 11 N., R. 9 E., M. D. B. and M., for storage purposes for irrigation and recreation use. Estimated cost of enlargement \$1,200.

SIERRA COUNTY—Canyon Creek Dam No. 293. H. L. Berkey, Tucson, Arizona, owner; rock crib, 15 feet above streambed with a storage capacity of 8 acre-feet, situated on Canyon Creek, tributary to North Fork of Yuba River, in Sec. 18, T. 21 N., R. 10 E., M. D. B. and M., for diversion purposes for mining use. Estimated cost \$500.

PLACER COUNTY—Gladhaven Dam No. 327. Carrie A. Gladding, Lincoln, owner; buttress, 19 feet above streambed with a storage capacity of 200 acre-feet, situated on Coon Creek, tributary to Feather River in Sec. 21, T. 13 N., R. 6 E., M. D. B. and M., for storage purposes for irrigation and domestic use. Estimated cost \$3,000.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources during the month of August, 1932.

PLUMAS COUNTY—Medora Dam No. 282. Feather River Improvement Company, Blairsden, owners; earth and rock, situated on Henderson ditch in Sec. 7, T. 22 N., R. 12 E., M. D. B. and M.

ALPINE COUNTY—Kinney Lake Dam No. 513-2. Alpine Land and Res. Co., Gardnerville, Nevada, owners; concrete, situated on Silver Creek, tributary to East Carson River in Sec. 7, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Lower Sunset Dam No. 513-3. Alpine Land and Res. Co., Gardnerville, Nevada, owners; earth and rock, situated on Markleeville Creek, tributary to East Carson River in Sec. 6, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Tamarac Lake Dam No. 513-5. Alpine Land and Res. Co., Gardnerville, Nevada, owners; earth and rock, situated on Markleeville Creek, tributary to East Carson River in Sec. 29, T. 9 N., R. 19 E., M. D. B. and M.

ALPINE COUNTY—Upper Kinney Lake Dam No. 513-6. Alpine Land and Res. Co., Gardnerville, Nevada, concrete, situated on Silver Creek, tributary to East Carson River in Sec. 7, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Upper Sunset Dam No. 513-7. Alpine Land and Res. Co., Gardnerville, Nevada, owners; earth and rock, situated on Markleeville Creek, tributary to East Carson River in Sec. 6, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Wet Meadows Dam No. 513-8. Alpine Land and Res. Co., Gardnerville, Nevada, owners; earth and rock, situated on Markleeville

Creek, tributary to East Carson River in Sec. 23, T. 9 N., R. 19 E., M. D. B. and M.

INYO COUNTY—Longley Reservoir No. 100-2. Hillside Water Company, Bishop, owners; rockfill, situated on McGee Creek, tributary to Owens River in Sec. 3, T. 8 S., R. 30 E., M. D. B. and M.

NEVADA COUNTY—Crooked Lake Dam No. 61-14. Nevada Irrigation District, Grass Valley, owners; rock, situated on South Fork Canyon Creek, tributary to South Yuba River in Sec. 23, T. 18 N., R. 12 E., M. D. B. and M.

ALAMEDA COUNTY—Lower San Leandro Dam No. 31-5. East Bay Municipal Utility District, Oakland, owners; rolled fill, situated on San Leandro Creek tributary to San Leandro Bay.

SAN BERNARDINO COUNTY—Wiggins Hill Dam No. 17. City of San Bernardino, San Bernardino, owner; earth, situated on Devil Creek, tributary to Santa Ana River, in Sec. 7, T. 1 N., R. 4 W., S. B. E. and M.

SAN MATEO COUNTY—Millbrae No. 3 Dam No. 618-3. Mills Estate, Inc., San Francisco, owner; earth, located in Buri Buri Ranch.

TEHAMA COUNTY—Gerber Dam No. 261. C. Fred Holmes, Gerber, owner; earth, situated on a gully, tributary to Thomas Creek in Sec. 4, T. 23 N., R. 4 W., M. D. B. and M.

PLACER COUNTY—Alta Forebay Dam No. 97-10. Pacific Gas & Electric Co., San Francisco, owner; earth, located in Sec. 30, T. 16 N., R. 11 E., M. D. B. and M.

SHASTA COUNTY—Coleman Forebay Dam No. 97-87. Pacific Gas and Electric Co., San Francisco, owner; earth, located in Sec. 32, T. 30 N., R. 2 W., M. D. B. and M.

NEVADA COUNTY—Lost River Dam No. 97-34. Pacific Gas & Electric Co., San Francisco, owner; rock crib, situated on tributary to South Yuba River in Sec. 2, T. 17 N., R. 13 E., M. D. B. and M.

TUOLUMNE COUNTY—Herring Creek Dam No. 97-71. Pacific Gas & Electric Co., San Francisco, owner; earth and crib, situated on Herring Creek, tributary to South Fork Stanislaus River in Sec. 30, T. 5 N., R. 19 E., M. D. B. and M.

TUOLUMNE COUNTY—Upper Strawberry Dam No. 97-84. Pacific Gas & Electric Co., San Francisco, owner; log crib, situated on South Fork, tributary to Stanislaus River in Sec. 14, T. 4 N., R. 18 E., M. D. B. and M.

TUOLUMNE COUNTY—Big Dam No. 97-103. Pacific Gas & Electric Co., San Francisco, owner; situated on South Fork, tributary to Stanislaus River in Sec. 9, T. 4 N., R. 19 E., M. D. B. and M.

EL DORADO COUNTY—Lower Cleese Dam No. 468. John P. Cleese, Placerville, owner; earth, situated on North Canon, tributary to South Fork American River in Sec. 35, T. 11 N., R. 11 E., M. D. B. and M.

MODOC COUNTY—Hager Basin Dam No. 122. Avanzino and Son, Alturas, owners; earth, situated on Hager Basin, tributary to Willow Creek in Sec. 36, T. 46 N., R. 10 E., M. D. B. and M.

YUBA COUNTY—Los Verjels Dam No. 334. Yuba Butte Orchards Company, Sacramento, owner; multiple arch, situated on Dry Creek, tributary to Yuba River in Sec. 34, T. 18 N., R. 6 E., M. D. B. and M.

SIERRA COUNTY—Upper Salmon Dam No. 294. Sierra Butte Canal and Water Company, San Jose, owner; rockfill, situated on lower end of Salmon Lake, tributary to North Fork Yuba River in Sec. 29, T. 21 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Lower Salmon Dam No. 294-2. Sierra Butte Canal and Water Company, San Jose, owner; rock and earth, situated on lower end of Lower Salmon Lake, tributary to North Fork Yuba River in Sec. 28, T. 21 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Upper Sardine Dam No. 294-3. Sierra Butte Canal and Water Company, San Jose, owner; rock wall—earth fill, situated on Sardine Creek, tributary to North Fork Yuba River in Sec. 9, T. 20 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Summit Lake Dam No. 294-5. Sierra Butte Canal and Water Company, San Jose,

Alteration Plans Approved in August

(Continued from preceding page)

owner; rockwall—earth fill, situated on tributary to North Fork Yuba River in Sec. 21, T. 21 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Packer Lake Dam No. 294-6. Sierra Butte Canal and Water Company, San Jose, owner; rock wall—earth fill, situated on Packer Creek, tributary to North Fork Yuba River in Sec. 5, T. 20 N., R. 12 E., M. D. B. and M.

LASSEN COUNTY—Rager Dam No. 226. Geo. F. Rager, Ravendale, owner; earth, situated on Cold Spring Creek, tributary to Madeline Plains in Sec. 6, T. 35 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Mitchell Dam No. 243. D. S. Mitchell, Susanville, owner; earth, situated on Dry Valley, tributary to Madeline Plains in Sec. 33, T. 35 N., R. 11 E., M. D. B. and M.

TEHAMA COUNTY—Dunn Ranch Dam No. 261-2. Tehama Ranch Company, Gerber, owner; earth, situated on a gulch tributary to Sacramento River in Sec. 25 N., R. 2 W., M. D. B. and M.

LOS ANGELES COUNTY—Sierra Madre Dam No. 32-13. Los Angeles County Flood Control District, Los Angeles, owner; arch, situated on Little Santa Anita Creek, tributary to Santa Anita Creek in Sec. 16, T. 11 N., R. 11 W., S. B. B. and M.

SAN DIEGO COUNTY—Murray Dam No. 56-5. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; multiple arch, situated on Chaparral Creek, tributary to San Diego River in Sec. 13, T. 16 S., R. 2 W., S. B. B. and M.

ORANGE COUNTY—Yorba Dam No. 791. Anaheim Union Water Company, Anaheim, owner; earth.

RIVERSIDE COUNTY—Lee Lake Dam No. 818-2. Temescal Water Company, Corona, owner; earth, situated on Temescal Creek, tributary to Santa Ana River in Sec. 7, T. 5 S., R. 5 W., S. B. B. and M.

RIVERSIDE COUNTY—Reynolds Slough Dam No. 823. Cheno Gun Club, Corona, owner; earth, situated on Mill Creek, tributary to Santa Ana River.

SOLANO COUNTY—Lake Herman Dam No. 442. Benicia Water Company, Benicia, owner; earth, situated on Sulphur Springs Creek in Sec. 24, T. 3 N., R. 4 W., M. D. B. and M.

LOS ANGELES COUNTY—Dry Canyon Dam No. 6-5. City of Los Angeles, Los Angeles, owner; earth, situated on Dry Canyon, tributary to Santa Clara in Sec. 35, T. 5 N., R. 16 W., S. B. B. and M.

VENTURA COUNTY—Lake Sherwood Dam No. 765. Lake Sherwood Country Club, Los Angeles, owner; arch, situated on Triunfo Creek, tributary to Malibu Creek in Sec. 27, T. 1 N., R. 19 W., S. B. B. and M.

RIVERSIDE COUNTY—Railroad Canyon Dam No. 818. Temescal Water Company, Corona, owner; arch, situated on San Jacinto, tributary to Lake Elsinor in Sec. 2, T. 6 S., R. 4 W., S. B. B. and M.

SAN MATEO COUNTY—Dennis Martin Dam No. 610. A. Schilling, San Francisco, owner; earth, situated on Dennis Martin Creek, tributary to San Francisco Creek.

AMADOR COUNTY—Kennedy Dam No. 477. Kennedy Mining and Milling Company, San Francisco, owner; multiple arch, situated on a ravine in Sec. 16, T. 6 N., R. 11 E., M. D. B. and M.

STANISLAUS COUNTY—Dallas Warner No. 1 Dam No. 59. Modesto Irrigation District, Modesto, owner; earth, located in Sec. 20, T. 3 S., R. 12 E., M. D. B. and M.

SISKIYOU COUNTY—Montague City Dam No. 60-2. Montague Water Conservation District, Montague, owner; earth, located in Sec. 23, T. 45 N., R. 6 W., M. D. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of August, 1932.

TEHAMA COUNTY—McGowan Dam No. 262. First National Bank of Santa Ana, Santa Ana, owner; earth and rock, 10 feet above streambed with a storage

capacity of 35 acre-feet, situated on Battle Creek, tributary to Sacramento River in Sec. 9, T. 29 N., R. 4 E., M. D. B. and M., for storage purposes for recreation use

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of August, 1932.

LASSEN COUNTY—Fulcher Dam No. 156-3. G. L. Kramer, Bieber, owner; buttress and flashboards, situated on Pit River, tributary to Sacramento River.

LASSEN COUNTY—Bieber Dam No. 254. Bieber Dam Association, Bieber, owner; buttress and flashboards, situated on Pit River, tributary to Sacramento River.

CONTRA COSTA COUNTY—Lafayette Dam No. 31-2. East Bay Municipal Utility District, Oakland, owner; earthfill, situated on an unnamed creek, tributary to Lafayette Creek in Sec. 26, T. 1 N., R. 3 W., M. D. B. and M.

RIVERSIDE COUNTY—Lake Hemet Dam No. 817. Lake Hemet Water Company, Hemet, owner; arch, situated on a tributary to San Jacinto River in Sec. 7, T. 6 S., R. 3 E., S. B. B. and M.

INYO COUNTY—Longley Reservoir No. 100-2. Hillside Water Company, Bishop, owner; rockfill, situated on McGee Creek, tributary to Owens in Sec. 3, T. 8 S., R. 30 E., M. D. B. and M.

PLUMAS COUNTY—Medora Dam No. 282. Feather River Improvement Company, Blairsden, owner; earth and rock, situated on Henderson Ditch in Sec. 7, T. 22 N., R. 12 E., M. D. B. and M.

ALPINE COUNTY—Kinney Lake Dam No. 513-2. Alpine Land and Res. Co., Gardnerville, Nevada, owner; concrete, situated on Silver Creek, tributary to East Carson River in Sec. 7, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Lower Sunset Lake Dam No. 513-3. Alpine Land and Res. Co., Gardnerville, Nevada, owner; earth and rock, situated on Markleeville Creek, tributary to East Carson River, in Sec. 6, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Tamarac Lake Dam No. 513-5. Alpine Land and Res. Co., Gardnerville, Nevada, owner; earth and rock, situated on Markleeville Creek, tributary to East Carson River in Sec. 29, T. 9 N., R. 19 E., M. D. B. and M.

ALPINE COUNTY—Upper Kinney Lake Dam No. 513-6. Alpine Land and Res. Co., Gardnerville, Nevada, owner; concrete, situated on Silver Creek, tributary to East Carson River in Sec. 7, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Upper Sunset Dam No. 513-7. Alpine Land and Res. Co., Gardnerville, Nevada, owner; earth and rock, situated on Markleeville Creek in Sec. 6, T. 8 N., R. 20 E., M. D. B. and M.

ALPINE COUNTY—Wet Meadows Dam No. 513-8. Alpine Land and Res. Co., Gardnerville, Nevada, owner; concrete, earth and rock, situated on Markleeville Creek, tributary to East Carson River in Sec. 23, T. 9 N., R. 19 E., M. D. B. and M.

SAN MATEO COUNTY—Cowell Dam No. 615. Dante Dianda, Halfmoon Bay, owner; earth and concrete, situated on Denniston Creek.

MODOC COUNTY—Willow Creek Swale Dam No. 121-4. W. O. Blasingame and Fred Huffmann, Alturas, owners; earth, situated on Willow Creek, tributary to Clear Lake in Sec. 24, T. 46 N., R. 10 E., M. D. B. and M.

NEVADA COUNTY—Faucherle Lake Dam No. 61-5. Nevada Irrigation District, Grass Valley, owner; timber, situated on Canyon Creek, tributary to South Yuba River in Sec. 13, T. 18 N., R. 12 E., M. D. B. and M.

NEVADA COUNTY—Crooked Lake Dam No. 61-14. Nevada Irrigation District, Grass Valley, owner; rock fill, situated on South Fork Canyon Creek, tributary to South Yuba River in Sec. 23, T. 18 N., R. 12 E., M. D. B. and M.

Plans Approved for the Enlargement of Dams During August

(Continued from page 37)

SAN BERNARDINO COUNTY—Wiggins Hill Dam No. 17. City of San Bernardino, San Bernardino, owner; earth, situated on Devil Creek, tributary to Santa Ana River in Sec. 7, T. 1 N., R. 4 W., S. B. B. and M.

ALAMEDA COUNTY—Lower San Leandro Dam No. 31-5. East Bay Municipal Utility District, Oakland, owner; earth, situated on San Leandro Creek, tributary to San Leandro Bay.

NEVADA COUNTY—French Lake Dam No. 61-6. Nevada Irrigation District, Grass Valley, owner; rock fill, situated on Canyon Creek, tributary to South Yuba River in Sec. 17, T. 18 N., R. 13 E., M. D. B. and M.

LAKE COUNTY—Scott Dam No. 97-101. Pacific Gas & Electric Company, San Francisco, owner; gravity, situated on South Fork, tributary to Eel River in Sec. 14, T. 18 N., R. 10 W., M. D. B. and M.

MODOC COUNTY—Toreson Dam No. 153. F. W. Caldwell, et al., Canby, owners; earth, situated on Tom's Creek, tributary to Pit River in Sec. 16, T. 41 N., R. 10 E., M. D. B. and M.

SIERRA COUNTY—Gardner's Point Dam No. 331-4. Loftus Blue Lead Mines, Los Angeles, owner; earth, located in Sec. 13, T. 21 N., R. 9 E., M. D. B. and M.

TEHAMA COUNTY—Gerber Dam No. 261. C. Fred Holmes, Gerber, owner; earth, situated on a gully, tributary to Thomas Creek in Sec. 4, T. 23 N., R. 4 W., M. D. B. and M.

SAN MATEO COUNTY—Milbrae Dam No. 3 No. 618-3. Mills Estate, San Francisco, owner; earth, located in Buri Buri Ranch near Milbrae.

PLACER COUNTY—Alta Forebay Dam No. 97-10. Pacific Gas & Electric Company, San Francisco, owner; earth, located in Sec. 30, T. 16 N., R. 11 E., M. D. B. and M.

NEVADA COUNTY—Lost River Dam No. 97-34. Pacific Gas & Electric Company, San Francisco, owner; rock, situated on tributary to Fordyce Creek, tributary to South Yuba River in Sec. 2, T. 17 N., R. 13 E., M. D. B. and M.

TUOLUMNE COUNTY—Herring Creek Dam No. 97-71. Pacific Gas & Electric Company, San Francisco, owner; earth crib, situated on Herring Creek, tributary to South Fork Stanislaus River in Sec. 30, T. 5 N., R. 19 E., M. D. B. and M.

TUOLUMNE COUNTY—Upper Strawberry Dam No. 97-84. Pacific Gas & Electric Company, San Francisco, owner; log crib, situated on South Fork, tributary to Stanislaus River in Sec. 14, T. 4 N., R. 18 E., M. D. B. and M.

SHASTA COUNTY—Coleman Forebay Dam No. 97-87. Pacific Gas & Electric Company, San Francisco, owner; earth, situated in Sec. 32, T. 30 N., R. 2 W., M. D. B. and M.

TUOLUMNE COUNTY—Big Dam No. 97-103. Pacific Gas & Electric Company, San Francisco, owner; rock crib, situated on South Fork, tributary to Stanislaus River in Sec. 9, T. 41 N., R. 19 E., M. D. B. and M.

MODOC COUNTY—Hager Basin Dam No. 122. Avanzino and Son, Berkeley, owners; earth, situated on Hager Basin, tributary to Willow Creek in Sec. 36 T. 46 N., R. 10 E., M. D. B. and M.

YUBA COUNTY—Los Verjels Dam No. 334. Yuba Butte Orchards Company, Sacramento, owner; multiple arch, situated on Dry Creek, tributary to Yuba River in Sec. 34, T. 18 N., R. 6 E., M. D. B. and M.

EL DORADO COUNTY—Lower Cleese Dam No. 468. John P. Cleese, Placerville, owner; earth, situated on North Canon, tributary to South Fork American River in Sec. 35, T. 11 N., R. 11 E., M. D. B. and M.

ORANGE COUNTY—Yorba Dam No. 791. Anaheim Union Water Company, Anaheim, owner; earth.

SIERRA COUNTY—Upper Salmon Dam No. 294. Sierra Butte Canal and Water Company, San Jose, owner; rock, situated on Salmon Lake, tributary to North Fork Yuba River in Sec. 29, T. 21 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Lower Salmon Dam No. 294-2. Sierra Butte Canal and Water Company, San Jose, owner; rock and earth.

SIERRA COUNTY—Upper Sardine Dam No. 294-3. Sierra Butte Canal and Water Company, San Jose, owner; rock wall and earth fill, situated on Sardine Creek, tributary to North Fork Yuba River in Sec. 9, T. 20 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Summit Dam No. 294-5. Sierra Butte Canal and Water Company, San Jose, owner; rock wall and earth fill, situated on tributary to North Fork Yuba River in Sec. 21, T. 21 N., R. 12 E., M. D. B. and M.

SIERRA COUNTY—Packer Lake Dam No. 294-6. Sierra Butte Canal and Water Company, San Jose, owner; rock wall—earth fill, situated on Packer Creek, tributary to North Fork Yuba River in Sec. 5, T. 20 N., R. 12 E., M. D. B. and M.

SAN DIEGO COUNTY—Murray Dam No. 56-5. La Mesa, Lemon Grove and Spring Valley Irrigation District, La Mesa, owner; multiple arch, situated on Chaparral Creek tributary to San Diego River in Sec. 13, T. 16 S., R. 2 W., S. B. B. and M.

LASSEN COUNTY—Rager Dam No. 226. Geo. F. Rager, Ravendale, owner; earth, situated on Cold Spring Creek in Sec. 6, T. 35 N., R. 16 E., M. D. B. and M.

LASSEN COUNTY—Mitchell Dam No. 243. D. S. Mitchell, Susanville, owner; earth, situated on Dry Valley, tributary to Madeline Plains in Sec. 33, T. 35 N., R. 11 E., M. D. B. and M.

TEHAMA COUNTY—Dunn Ranch Dam No. 261-2. Tehama Ranch Company, Gerber, owner; earth, situated on Dry Gulch, tributary to Sacramento River.

RIVERSIDE COUNTY—Lee Lake Dam No. 818. Temescal Water Company, Corona, owner; earth, situated on Temescal Creek, tributary to Santa Ana in Sec. 7, T. 5 S., R. 5 W., S. B. B. and M.

RIVERSIDE COUNTY—Reynolds Slough Dam No. 823. Chino Gun Club, Corona, owner; earth, situated on Mill Creek, tributary to Santa Ana River.

LOS ANGELES COUNTY—Dry Canyon Dam No. 6-5. City of Los Angeles, Los Angeles, owner; earth, situated on Dry Canyon, tributary to Santa Clara in Sec. 35, T. 5 N., R. 16 W., S. B. B. and M.

SOLANO COUNTY—Lake Herman Dam No. 442. Benicia Water Company, Benicia, owner; earth, situated on Sulphur Springs Creek in Sec. 24, T. 3 N., R. 4 W., M. D. B. and M.

SAN MATEO COUNTY—Dennis Martin Dam No. 610. A. Schilling, San Francisco, owner; earth, situated on Dennis Martin Creek, tributary to San Francisco Creek.

RIVERSIDE COUNTY—Railroad Canyon Dam No. 818. Temescal Water Company, Corona, owner; arch, situated on San Jacinto Creek, tributary to Lake Elsinore in Sec. 2, T. 6 S., R. 4 W., S. B. B. and M.

AMADOR COUNTY—Kennedy Dam No. 477. Kennedy Mining and Milling Company, San Francisco, owner; multiple arch, situated on a ravine, tributary to Jackson Creek in Sec. 16, T. 6 N., R. 11 E., M. D. B. and M.

STANISLAUS COUNTY—Dallas Warner No. 1 Dam No. 59. Modesto Irrigation District, Modesto, owner; earth, Sec. 20, T. 3 S., R. 12 E., M. D. B. and M.

PLUMAS COUNTY—Grizzly Creek Dam No. 285. Clover Valley Lumber Company, Loyalton, owner; slab and buttress, situated on Grizzly Creek, tributary to Middle Fork Feather River in Sec. 20, T. 23 N., R. 14 E., M. D. B. and M.

WATER PERMITS GRANTED

(Continued from page 34)

c.f.s. from Wilson Creek tributary to Klamath River in Sec. 17, T. 11 N., R. 6 E., H. B. and M. For mining purposes.

SUTTER COUNTY—Permit 3963, Application 6919. W. A. and John W. Saunders, Tudor, August 23, 1932, for 15.5 c.f.s. from Feather River tributary to Sacramento River in Sec. 1, T. 13 N., R. 3 E., M. D. B. and M. For irrigation of 383.64 acres. Estimated cost \$20,000.

SUTTER COUNTY—Permit 3964, Application 6920. Grover C. Shannon, Tudor, August 23, 1932, for 3.50 c.f.s. from Feather River tributary to Sacramento River in Sec. 1, T. 13 N., R. 3 E., M. D. B. and M. For irrigation of 86.68 acres of orchard. Estimated cost \$20,000.

LOS ANGELES COUNTY—Permit 3966, Application 7269. U. S. Angeles National Forest, 501 Brownstein Street, Los Angeles, August 24, 1932, for 0.002 c.f.s. from White Spring tributary to Piru Creek in Sec. 29, T. 6 N., R. 17 W., S. B. B. and M.

Tablet Marks First Discovery of Gold in Shasta County, 1848

AT THE northwest end of the new highway bridge across Clear Creek, on the Pacific Highway, three miles south of Redding, Shasta County, is a bronze tablet, mounted on a native boulder, placed there by the California Highway Commission to tell the traveler, that on this historic stream the most northern gold discovery in California was made by Major P. B. Reading in the early spring of 1848.

The site of the discovery is five miles up the creek at Reading's Bar, marked by a wooden sign. The photograph and following facts were furnished by Miss Mae Southern of Redding:

Major Reading entered California via the Pit River gateway and arrived at Sutter's Fort November 10, 1843, and in December, 1844, secured from Governor Micheltorena, the northernmost land grant in California, comprising more than 26,000 acres extending along the Sacramento River from Salt Creek to the mouth of Cottonwood Creek.

When Marshall made the discovery of gold at Coloma, Major Reading was among the first to visit the scene and noting the soil was the same, he was satisfied there was gold near his ranch. Returning home he and his Indians washed out the first gold on a bar at the mouth of the canyon of Clear Creek in March 1848. He employed 150 Indians and squaws and took out as much as 52 ounces in a day.

At the top of the tablet is depicted Mt. Shasta and the California Grizzly bear, the official emblem of the Shasta Historical Society.

The inscription reads:

"In 1848 gold was first discovered on this creek by Major Pierson Barton Reading, Early California Pioneer.

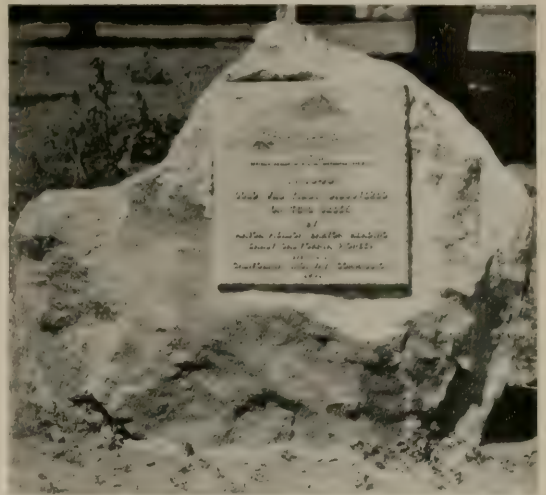
Erected by the California Highway Commission, 1931—Dedicated May 23, 1932."

"I hear your wife has taken up golf."

"Well, she intended to, but the tailor was two weeks late with her knickers and I couldn't get delivery on a sports roadster for her. She expects to start in about two weeks."

Betty was taking her first ocean voyage, and for the first three days the sea was smooth as glass. On the fourth day out a squall came up and the good ship bounced around like a broncho.

"Mother," finally asked Betty, "What's the matter? Are we on a detour?"—*South Dakota Hwy Mag.*



FORTUNE SMILED on Major P. B. Reading in 1848 when he found gold on Deer Creek, as commemorated by this tablet marker on the Pacific Highway.

HIGHWAY BIDS AND AWARDS FOR AUGUST

(Continued from page 28)

Angeles, \$18,061. Contract awarded to F. W. Teschke, Hollywood, \$18,400.

SAN BERNARDINO COUNTY—4.5 miles to be graded and surfaced between Camp Waterman and Arrowhead Springs. Dist. VIII, Rt. 43, Sec. A. Weymouth-Crowell Co., Los Angeles, \$329,296; Fredrickson & Watson, Oakland, \$398,496; Gibbons & Reed Co., Burbank, \$454,119; Sharp & Fellows Contracting Co., \$392,803; Mittry Bros. Construction, Los Angeles, \$366,004; Isbel Construction Co., Carson City, Nevada, \$408,069; George Pollock Co., Sacramento, \$357,861; Hemstreet & Bell, Marysville, \$375,848; Meyer Rosenberg, San Francisco, \$349,760; J. G. Donovan & Son, Los Angeles, \$436,621; Peninsula Paving Co., & J. P. Holland, Inc., San Francisco, \$294,443; Hall-Johnson Co., and M. S. Ross, Alhambra, \$408,260; Kern & Kibbe, Portland, Oregon, \$339,230; Von der Helen & Pierson, Castaic, \$299,910; T. M. Morgan Paving Co., Los Angeles, \$348,683; Jahn & Bressi Const. Co., Los Angeles, \$292,159.

SAN JOAQUIN COUNTY—A bridge across Paradise Cut, 6.2 miles east of Tracy, consisting of ten 44-foot steel stringer spans with concrete deck on concrete pile bents and approaches to be paved with Portland cement concrete. Dist. X, Rt. 5, Sec. B. Nelson & Wallace, Escalon, \$45,532; E. A. Hawkins Co., San Francisco, \$51,836; W. E. Lyons, Oakland, \$46,992; Oberg Bros., Los Angeles, \$51,976; A. W. Kitchen, San Francisco, \$47,091; Fred J. Maurer, Inc., Eureka, \$50,868; Clyde W. Wood, Stockton, \$45,318; Fredrickson & Watson, Oakland, \$47,813; Neves & Harp, Santa Clara, \$47,036; J. P. Brennan, Redding, \$50,848; L. C. Seidel, Oakland, \$47,864. Contract awarded to Lord & Bishop, Sacramento, \$44,429.

SHASTA COUNTY—Building an addition to the District Office Building at Redding. Dist. II, Rt. J, Sec. B. Rolla Arbuckle, Anderson, \$7,595; J. P. Brennan, Redding, \$7,600; Luigi Cascentino, Duns-muir, \$7,765; R. B. McKenzie, Red Bluff, \$7,900; Andrew Siri, Duns-muir, \$7,950; F. H. Neilson, Orland, \$8,904; J. W. Anderson, Mt. Shasta, \$9,496. Contract awarded to Theodore Johanns, San Francisco, \$7,488.

There is only one motor vehicle for every 113 inhabitants in Czecho-Slovakia. The last census showed 58,000 passenger cars, 30,000 trucks, 3600 buses, and 39,000 motorcycles in the entire country.

Improvements of Mother Lode Route Continued Since 1929

(Continued from page 23)

miners, which give this center a typical mining town atmosphere. Jackson is the County seat of Amador County, and one of the interesting sights is the old court house, with the old town well and bucket, which up to a short time ago was used generally by the people of the neighborhood. Jackson still has a number of the old, original buildings, but here, unfortunately, as in other Mother Lode towns, they are rapidly being modernized.

The return trip can be made by a different route, following the Jackson Lateral State Highway, if desired, by the way of Ione, Clay, and the Sacramento-Stockton State Highway from Twin Cities.

SCENE OF HOLD-UP

On this road, a few miles from the Mother Lode junction near Martell, is a monument erected by the Native Sons of the Golden West to the memory of the old time stage drivers. This monument is placed at the exact spot where a bandit shot and killed Michael Tovey, the Wells-Fargo shotgun messenger on one of the regular stages.

We pass through the business district of Ione and by the Preston School of Industry, a State supported institution for delinquent boys.

The rest of the trip is over a good rock-surfaced road, and from Twin Cities over a recently built 20-foot cement concrete pavement to Sacramento.

The improvement of the section of the Mother Lode Highway hereinbefore described, with the exception of the first mile from Central House, has all been done since 1929—the grading in two major contracts, the first extending from Dry Town to Amador City; the second, from Amador City to Martell. Two types of surfacing are being used; the first stretch already completed from Dry Town to Amador City, being a crushed rock base 20 feet wide with an armor coat. The balance, upon which a contract has just been awarded, will be a cut-back road mix on top of the present crushed rock base.

The route covered in the above described trip has been designated the "Flag Route," as by referring to the map, it will be seen that Route 4 is the staff, the other roads forming the flag.

California Highways Extolled by Visitors to Olympic Sports

COMMENTS of motorists from other States who came to California this summer for the Olympic Games and to tour the State indicate that a profound impression was made upon these visitors by the fine system of highways.

Highly complimentary letters, verbal comments, and newspaper notices are cited by the motorists' organizations as evidence that those who traveled to California by automobile toured extensively throughout the State and were close observers of the attractive motoring conditions which greeted them.

One such letter was from H. C. Hotaling, executive secretary of the National Editorial Association, from his headquarters in St. Paul, Minn., who on his visit to California represented Minnesota in an official capacity. Mr. Hotaling wrote:

As State Tourist Commissioner of Minnesota, I could not help but notice and admire the wonderful highway system of California. I do not know who is responsible, but whoever he is, he's entitled to the thanks of all highway travelers. Commissioner of Highways Babcock of Minnesota has performed a great task, but with your mountains to deal with, your Highway Commissioner has overcome the almost impossible.

Cost of Eliminating Dust Hazard Small

AMONG the projects which mark the progress made by the Division of Highways on State highway construction during recent months are some which provide for the oil treatment of many miles of unsurfaced roads.

While not a major item from the standpoint of cost, the department has been stressing the importance of reducing the dust nuisance on unsurfaced roads throughout the State. A recent report stated that projects under way called for oiling 502 miles of roads at a cost of \$276,100.

California's highway administrators recognize that safe operation of modern motor vehicles, built to travel at sustained high speeds, requires a clear field of vision for the driver.

Although costs are of secondary importance where matters of public safety are concerned it is found that, based on the traffic count of the California Highway Maintenance Department, the dust hazard is eliminated on the State's unsurfaced roads, by oil treatment, at a cost of less than one-third of a cent per mile per car.—*Asphalt Institute.*

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

COLONEL WALTER E. GARRISON-----Director

JAMES I. HERZ-----Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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HARRY A. HOPKINS, Taft

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PHILIP A. STANTON, Anaheim

FRANK A. TETLEY, Riverside

C. H. PURCELL, State Highway Engineer, Sacramento

JOHN W. HOWE, Secretary

HUGH K. McKEVITT, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

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L. V. CAMPBELL, Office Engineer

T. E. STANTON, Materials and Research Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

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F. W. HASELWOOD, District II, Redding

CHARLES H. WHITMORE, District III, Sacramento

J. H. SKEGGS, District IV, San Francisco

L. H. GIBSON, District V, San Luis Obispo

E. E. WALLACE, District VI, Fresno

S. V. CORTELYOU, District VII, Los Angeles

E. Q. SULLIVAN, District VIII, San Bernardino

J. W. VICKREY (Acting), District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

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J. J. HALEY, Jr., Administrative Assistant

HAROLD CONKLING, Deputy in Charge Water Rights

A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

SPENCER BURROUGHS, Attorney

EVERETT N. BRYAN, Hydraulic Engineer, Water
Rights

A. N. BURCH, Irrigation Investigations

H. M. STAFFORD, Sacramento-San Joaquin Water
Supervisor

GORDON ZANDER, Adjudication, Water Distribution

KATHERINE A. FEENY, Chief Clerk

MABEL PERRYMAN, Secretary

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W. K. DANIELS, Deputy Chief of Division

HEADQUARTERS

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CARLETON PIERSON, Specification Writer

C. O. PALM, Chief Clerk

C. E. BERG, Engineer, Estimates and Costs

J. W. DUTTON, General Superintendent Construction

W. H. ROCKINGHAM, Mechanical Engineer

C. A. HENDERLONG, Assistant Mechanical Engineer

W. M. CALLAHAN, Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

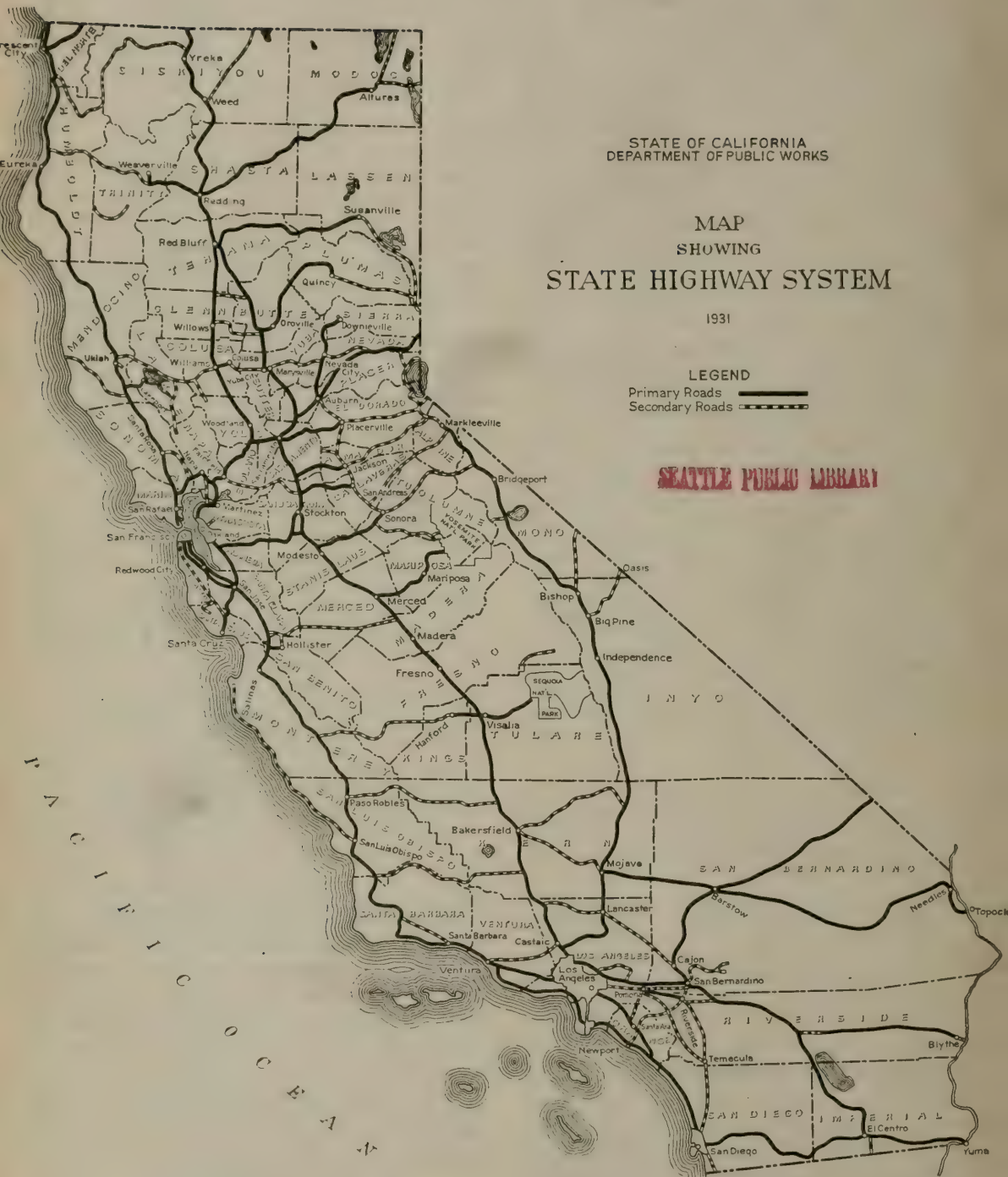
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample



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CALIFORNIA HIGHWAYS and PUBLIC WORKS



State Highways Providing Work for Unemployment Relief

Official Journal of the Department of Public Works
OCT-NOV. State of California, 1932

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Highway Jobs for 9000 Men Bring Relief to 30,000 Family Dependents

Department of Public Works and Highway Commission Expending \$6,317,000 on Road Work Under Governor's Order to Relieve Unemployment Situation

UNDER urgent orders from Governor James Rolph, Jr., to bend every effort toward repulsing the grim spectre of unemployment that becomes more menacing as the winter season advances, the Department of Public Works, under Director Earl Lee Kelly, and the California Highway Commission are carrying out the Governor's instruction to devote every penny of State and Federal funds legally available to the cause of unemployment relief.

To this end the two State agencies have provided for the expenditure of \$6,317,000 in giving relief employment to approximately 9000 men bringing steady pay roll money to the support of some 30,000 family dependents in every part of the State.

This \$6,317,000 employment fund is made up of \$4,667,000 Federal aid money giving jobs to 3000 men working under contractors and \$1,650,000 of State funds giving employment throughout the winter to 3000 men with families and 2000 to 2500 single men in highway and forest camps.

Twenty projects totaling 54.8 miles of road construction and including 11 bridges are now under way with an estimated cost of \$3,418,000. Twelve additional projects totaling \$1,885,400 will be advertised by December 1st,

making a grand total of \$5,303,600 worth of work under way by that date.

The \$1,650,000 highway fund includes \$1,230,000 for the expansion of maintenance crews in the ten districts of the Division of Highways, \$120,000 for the establishment of a highway construction camp in Los Angeles County and \$300,000 to which will be added

\$100,000 for use in establishing forest camps adjacent to State highways. These forest camps will be administered cooperatively by the Division of Forestry and the Department of Public Works and the men will be engaged in work for the protection of the highways.

The increased maintenance program will continue similar work carried on during the two previous winters. This type of work is chosen for the major portion of the relief work because it lends itself to a maximum increase in personnel. The funds have been divided between the northern and south-

ern portions of the State and distributed to the districts for increasing their maintenance crews.

It is estimated that the \$1,230,000 to be used for the expansion of maintenance activities will provide employment for more than 3000 men working three days a week over a period of six months.



GOVERNOR JAMES ROLPH, JR.

Earl Lee Kelly Appointed Director of Public Works by Governor Rolph

EARL LEE KELLY of Redding, who has served with distinction as chairman of the California Highway Commission and director of the State Tax Research Bureau under the present administration was appointed director of the Department of Public Works by Governor James Rolph, Jr., on October 14th, was immediately sworn in and took over the duties of his new office.

During his tenure as chairman of the Highway Commission Mr. Kelly covered almost every mile of the State highway system in the course of his official duties and efficiently guided the deliberations and decisions of the Commission from the day that body took office.

He therefore brings to his new position a wealth of knowledge and experience concerning every problem and policy in the development of the State's vast highway system and a demonstrated executive capacity to wisely direct and successfully manage the affairs of this important department of the State government controlling the expenditure of many millions of the public funds.

BAY BRIDGE RESPONSIBILITY

In addition to the work of the Division of Highways, the Division of Architecture and the Division of Water Resources, Director Kelly will have jurisdictional supervision over the construction of the great San Francisco-Oakland Bay Bridge that the Department of Public Works is charged with erecting and maintaining for a period of ten years or until the bridge revenues have repaid the \$62,000,000 and any further sums advanced for the purchase of bonds by the Federal Reconstruction Finance Corporation.

In appointing Mr. Kelly to this high office, Governor Rolph chose a young man whose active and successful career in business, civic and political life has made him an outstanding figure in the State—the career of a self-made man.

As a poor boy in Humboldt County, Earl Lee Kelly was determined to get a good education and worked his way through Eureka



EARL LEE KELLY

schools by carrying and selling newspapers. He worked his way through the University of California by securing employment during vacation periods, in one instance driving mules for a contractor on a highway job in Placer County over which he now has jurisdiction. He graduated from the University law school in the class of 1915 and secured employment with a title and abstract company.

SERVED AS "BUCK PRIVATE"

Before he could get fairly started in this business the United States entered the World War and he became a "buck private" in the 12th Infantry, 8th Division. Returning from army service Mr. Kelly started for himself in the title and insurance business in Redding with one typewriter that he lugged under his arm back and forth between the county court-

Commissioner Harry A. Hopkins Made Chairman of State Highway Board

HARRY A. HOPKINS of Taft, Kern County, is the new chairman of the California Highway Commission endorsed by Governor Rolph as successor to Earl Lee Kelly recently elevated by the Governor to the directorship of the Department of Public Works. Mr. Hopkins has been a member of the present unsalaried commission since it took office and its work has become an all-absorbing hobby with him. He has made an intensive study of all phases of the State's progress in highway development and eminently qualified himself for the new honor by outstanding work as a commissioner that has made him one of the best informed men in the State on highway policies and problems.

With the background of a long and varied career of success in business and civic life, Mr. Hopkins says:

"In all of my business, social and civic activities, I have never found anything so interesting as the activities I am now engaged in as chairman of the California Highway Commission through endorsement of the Governor."

SON OF PIONEER

The son of one of the pioneer stage drivers of California who escaped the bullets of bandits to organize a large horse and cattle raising business and now lives in retirement in Los Angeles, Mr. Hopkins graduated from the Los Angeles High School and soon was attracted by the oil business with which he has been continuously connected in different capacities. His duties as assistant field manager for a large company took him into the Kern County oil areas. He settled at Taft in 1909 and as the first postmaster named the town after the President of the United States. When the city was incorporated in 1910 he was a member of the first board of city trustees serving eight years, and became the first mayor.

In 1910 he organized a public utilities company and installed a city water system and later started an ice company of which he has been manager and secretary-treasurer ever since. He has taken a part in oil develop-



HARRY A. HOPKINS

ments all over the State and has interests in Huntington Beach, Signal Hill and Midway oil fields. As operator of the Pacific Oil Salvage Company he has had experience in the contracting business and the operation of heavy equipment. He is identified with the California Oil and Gas Association and the American Petroleum Institute.

Mr. Hopkins' contributions to the civic and social life of his community and State have covered a wide range of activities. As an organizer of the Kern County Chamber of Commerce, he served as chairman of its finance and highway committees. He helped to organize and served as president of the West Side Associated Charities with all welfare and member organizations clearing through its office.

(Continued on page 21)

Tehachapi Flood Damage to Highway and Bridges \$45,000—15 Bodies Found

By **WALTER BEUTHEL**, Assistant District Engineer

THE Tehachapi range of mountains, which is crossed by the main line of the railroads and a secondary highway route from Bakersfield to Mojave, is subject to very violent rainstorms during the spring and fall seasons. Nearly every year some flood damage occurs. Delays to travel are not uncommon although a continuous process of strengthening and improving the highway is the policy of the State. The storms, except during the winter season, are usually short and cover a relatively small area. Run-off is extremely rapid due to heavy precipitation, the absence of vegetation and the topography of the country.

The torrential rains which occurred during the last week of September 1932, in this region, were unusual in intensity, extent and duration. The storm began on September 28th in the plateau region of Tehachapi and the surrounding higher country. Some small damage to culverts and the road was reported soon after.

The rain continued at intervals and reached cloudburst volume on September 30th during the afternoon and evening. The storm total at Tehachapi was over four inches and the maximum in the mountains probably several times this figure.

MASS OF DEBRIS

The brush, logs and mud from a wide area of mountain country was brought to the channel of Tehachapi Creek and carried downstream as the storm progressed. From the vicinity of Cameron to near Monolith a deposit of mud and debris to a maximum depth of three feet was left on the road.

West of Tehachapi a drainage pipe, five feet in diameter, was dislodged from the embankment and moved a thousand feet.

Near Tehachapi and Monolith the water covered the road to a considerable depth and washed great channels along the roadside, resulting in the loss of much surfacing and embankment.

Near Woodford a long freight train with five engines waited on a sidetrack as a passenger train passed. The engines were dis-

tributed through the freight train at about equal intervals. Strangely enough, one of those giantallet locomotives stood over a large reinforced concrete arch culvert which carried the two tracks over Tehachapi Creek. Another engine ahead was near the creek over a water-soaked embankment.

HURLED INTO CREEK

As the water rose in the creek the culvert proved inadequate to carry the deluge. The water rose to a height of six feet on the freight cars as the debris shut off the flow below them.

Then suddenly the flood was released as the train separated and the locomotive fell to the creek bed, carrying several cars with it.

The water shot directly against the highway built in the canyon wall. The road was obliterated and the rock scoured clean for 155 feet. A partial loss of width occurred for 300 feet more.

In the path of the released waters stood the Kaad Service Station where about a dozen people had taken refuge from the rain. The building and people were swept away, only the concrete floor remaining. The locomotive on the embankment in the forward part of the train sank into the creek, disappeared in the mud and was not found for several days.

BRIDGES CARRIED AWAY

The wall of water continued on down the canyon, wrecking several railroad bridges and damaging the tracks. No further highway damage occurred until the flow reached Caliente Wash. There the canyon ends and Tehachapi Creek, reinforced by and known as Caliente Creek, normally spreads out and sinks into the sand.

The flood, however, carried away both the railroad bridge and the highway bridge over Caliente Creek. It also reached a railroad borrow ditch and continued on to Walker Basin Creek a mile further. The debris carried was enormous and clogged the rail-

(Continued on page 38)

BROKEN DOWN

by flood debris hurled like battering rams against the underpinning, the old highway bridge across Walker Basin Creek was put out of commission by the Tehachapi disaster.

**SAVED BY OIL.**

Effect of drift and scour on highway about a mile west of Bend. Note damage stops at edge of the oil mat surface of the road.

DOWN TO BED-ROCK.

The road was washed away and the rock scoured clean for 155 feet along Tehachapi Creek. Road crew with compressor for drilling and shooting quickly got road open for one-way traffic.

**ENGINE AND CARS**

went down into creek at Woodford when flood washed out culvert under tracks and broke long freight train carrying many men to death in the torrent.

\$62,000,000 Federal Aid Assured for Bay Bridge Giving Work to 8300 Men

CONTRACTS for the construction of the San Francisco-Oakland Bay Bridge will be let February 15th. This welcome news to the entire State, that the \$75,000,000 project will become a reality, was recently announced by Director of Public Works, Earl Lee Kelly and Chief Engineer, C. H. Purcell.

The Reconstruction Finance Corporation has made an official commitment to purchase \$62,000,000 of the Bay Bridge revenue bonds, bearing 5 per cent interest. This commitment was obtained by a special committee sent to Washington by the State Bridge Authority at the behest of Governor Rolph. The committee included Harrison S. Robinson and Joseph R. Knowland of Oakland, Leland W. Cutler of San Francisco, Chief Engineer Purcell, Bridge Engineer Chas. E. Andrew and C. C. Carleton, attorney of the State Department of Public Works. The return of the special committee was celebrated by civic ceremonies in both San Francisco and Oakland.

LEGISLATION REQUIRED

The Reconstruction Finance Corporation requires the State Toll Bridge Authority to finance the approaches to the bridge, estimated at \$6,000,000, by the time the structure is completed and to maintain and operate it at State expense. These requirements will necessitate action by the California Legislature in January.

The maintenance funds, after the bridge is completed, will be budgeted out of the regular maintenance fund the same as on all of our State highways and bridges. Our existing law, provides that on completion, this bridge may become a part of the State highway system for maintenance only. The corrective law will be necessary in order that the action of one Highway Commission shall continue as binding in the future so that the bondholders may be assured the agreement will be legally carried out.

The citizens of Oakland and San Francisco will pay the greatest amount toward the construction of the bridge proper due to the fact that the larger amount of tolls will naturally come from this source. The traffic tolls paid

by travelers from other parts of the State in proportion, will be small.

RELIEF FOR JOBLESS

The approaches adopted and agreed upon are only such connections as are necessary to properly serve traffic so that bridge earnings can be the maximum.

The first contract to be let will cover the foundations for the huge structure, estimated to cost \$15,240,000. The second will include the San Francisco anchorage, estimated to cost \$1,110,000; the Yerba Buena Island Tunnel Crossing, \$2,100,000; and dredging for mole construction, \$3,450,000—a total of \$6,660,000. The third contract will cover the West Bay Superstructure, costing approximately \$16,600,000. The final contract for the East Bay Superstructure will approximate an expense of \$8,900,000.

A large measure of relief to the unemployment situation in the San Francisco Bay area is assured with the start of the bridge. The project will employ directly 6000 men over a period of four years and 2300 additional workers in local shops.

LARGE SAVINGS ASSURED

Completion of the structure will result in a great economy for all who cross the bay. The savings in time and money may be summarized as follows: Each commuter will save between 10 and 15 minutes on each trip. Automobiles will save 30 minutes per trip. This time saving computed at 50 cents per hour for an estimated 35,000,000 commuters crossing the bay will amount to at least \$3,000,000 per year. In addition, the 16,000,000 auto passengers will save \$4,000,000 or a total saving of \$7,000,000 per year.

The total tolls to be paid by both interurban and auto passengers during 1937 are placed at \$6,356,000. A comparison of these figures shows that the traffic crossing the bay will actually save more money in time than it will cost them to cross the bay. This saving will increase each successive year while the bridge is being paid for.

In addition the saving on account of reduced tolls over those now charged, assum-



Photo Courtesy of San Francisco Chronicle.

TRIUMPHANT AMBASSADORS OF CALIFORNIA, George T. Cameron, Leland W. Cutler, Joseph R. Knowland and Harrison S. Robinson, members of the Advisory Fiscal Committee of the California Toll Bridge Authority, reported to Governor Rolph and fellow bridge officials on returning from Washington their success in obtaining from the Reconstruction Finance Corporation an advance of \$62,000,000 for the purchase of the bridge bonds. Seated, in the group above (left to right), are Mr. Cameron, Mr. Cutler, Governor Rolph, Rolland Vandegrift, State Director of Finance, and Mr. Robinson. Standing are Earl Lee Kelly, Director of Public Works, Mr. Knowland and Chief Engineer C. H. Purcell.

ing that ferry tolls remain as at present, will amount to approximately \$30,000,000 over the 20-year period during which time the bridge will be paid for, and will then become a free bridge.

\$30,000,000 LESS TOLLS

In other words, the public travel over the bay will pay, through tolls, for this bridge in 20 years after it is opened, after which time the bridge will become free of tolls. During that time they will have saved more in time value than they will have spent for tolls, and in addition they will have saved \$30,000,000 in tolls as compared with the ferry tolls now being charged.

The principal dimensions and quantities of materials to be used in the Bay Bridge are listed below:

Length of Project—	
San Francisco Terminal to San Francisco Anchorage.....	4,200 feet

West Bay Crossing.....	10,450 feet
Island Section.....	2,950 feet
East Bay Crossing to Toll Plaza.....	19,400 feet
Toll Plaza to Oakland Terminal.....	6,500 feet
Total	43,500 feet—8½ miles

Quantities of Materials—

Structural Steel	152,000 tons
Cable Wire	18,000 tons
Reinforcing Steel	17,000 tons
Concrete	1,000,000 cu. yds.
Cement	1,300,000 bbl.
Timber	30,000,000 f.b.m.
Paint	200,000 gal.

West Bay Crossing—

Height of towers above water.....	465 and 505 feet
Depth of piers below water.....	100 to 210 feet
Height of center anchorage above water.....	301.5 feet
Length of center spans.....	2,310 feet
Length of side spans.....	1,160 feet

Clearances (Vertical)—

Center of center span.....	200 feet
At center anchorage.....	216 feet
Number of cables.....	2
Number of wires in each cable.....	17,020
Diameter of each wire.....	0.195 in.
Total length of cable wire.....	68,950 miles
Total length of 21" suspender ropes.....	43 miles

East Bay Crossing—

Length main span.....	1,400 feet
Clearance above high water.....	185 feet

"Matrimony" is a serious word, says a magazine writer. Word? We thought it was a sentence.—*Atlanta Constitution*.

"Is your wife fond of listening in?"

"Not half so much as she is of speaking out."—*Georgia Highways*.

Determination of Oil Content for Oil Road Mixes by Surface Area Analysis

By F. N. HVEEM, Assistant Testing Engineer, Research Department

The so-called "California Type" of oil surfaced road has won wide renown for durability and low construction cost. The success in building such roads depends upon using the correct amount of oil for a given grading and aggregate. Over-oiled mixes produce surfaces that become pushed and rutted under traffic. Raveled surfaces result from lack of oil. Engineers differ on how to determine the right amount. The following article describes the method developed by the writer and used by the Materials and Research Department of the California Division of Highways.

THE INCREASING demand for improved highway surfaces combined with a reduction in available funds per mile of road to be improved has necessitated the greatest economy in construction consistent with traffic demands. As a result the question of low cost road surfacing has, of recent years, presented a serious problem to the highway engineer. This situation has encouraged the development of the inexpensive oiled surface types of California and elsewhere.

Without discussing the relative merits of widely used oiled surface treatments and penetration macadams, it can be stated that one of the most successful methods is the oil mix process, sometimes called "California Type." Here the oil treated aggregate may be mixed either on the road by graders, or in a central mixing plant with the binding medium ranging from fuel oil to cutback asphalt. The underlying principles are the same, regardless of the nature of the binding medium or method of mixing.

OIL CONTENT VARIES

Any surfacing process that best meets the requirement of low initial cost must inevitably permit the use of suitable local aggregate without expensive treatment.

The successful use of local materials which vary in grading and character has shown that the amount of oil required for best results also varies considerably. In the past there has been a lack of agreement as to a

satisfactory method for determining in advance the proper amount of oil for different mixes. Engineers have even differed considerably as to the correct amount of oil for a given grading and aggregate.

Many highway builders have shown a strong preference for low oil content or dry mixes. The belief that such dry mixes are the most stable is not borne out by stability tests and recent surveys show that through-

out the West the tendency is toward a higher oil content.

Where a sensible attempt has been made to control the amount of oil, very few examples of over oiled roads have been observed. On the contrary, a number of projects have indicated a lack of oil by raveling under traffic.

FORMULAS DEVELOPED

Experience proves that many materials need, for best results, a definite amount of oil and also that it is frequently difficult to determine by inspection during construction whether or not this correct amount is being used.

Even though experienced

men may be able to gauge the amount of oil by appearance or "feel," such methods can not be included in specifications. Also men with the requisite experience are frequently not available when needed.

Some specifications (California) have attempted to fix the oil requirements by means of a "pat stain test" which is made by placing a sample of the oiled material passing a 10-mesh screen on a piece of white paper, applying pressure through a wood block and exam-



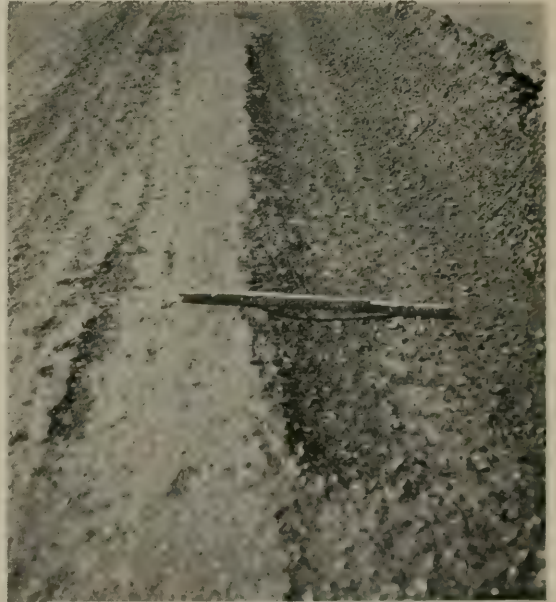
F. N. HVEEM



ONE HUNDRED PER CENT right is this "California Type" highway—hard, smooth and durable with low initial cost. The picture shows a primary road of proper oil mix construction in Tehama County.



TOO MUCH OIL in the mixture causes the road surface to become pushed and rutted under traffic due to instability and resulting in much quicker deterioration with a largely increased expense for maintenance.



NOT ENOUGH OIL in the mixture produces a surface that becomes badly raveled under traffic.

ining the resulting stain on the paper. The test is difficult to interpret properly and is generally conceded to be too erratic to be of great value.

Several formulas have been developed. Probably the most widely used has been the formula developed by McKesson and Frickstad which provides that $P = .015 a + .036 b + .017 c$.

Where P = percentage of oil by weight

a = % by weight of material retained on a 10-mesh sieve.

b = % by weight of material passing No. 10 and retained on No. 200.

c = % by weight of material passing 200-mesh sieve.

This pioneer formula has had considerable usefulness, but the consensus of opinion now is that while correct in form, the numerical coefficients first chosen give too low an oil content and do not give consistent results between wide ranges in grading and type of aggregate.

FACTS AND THEORIES

The development of a more satisfactory method for estimating correctly the oil requirements has necessi-

How Oil Mix Formula was Developed

(Continued from page 9)

TABLE OF SURFACE AREA EQUIVALENTS

TABLE #1 10 SIEVES			TABLE #2 7 SIEVES			TABLE #3 7 SIEVES			TABLE #4 4 OR 5 SIEVES			TABLE #5 3 SIEVES		
SIEVES	SUR. AREA		SIEVES	SUR. AREA		SIEVES	SUR. AREA		SIEVES	SUR. AREA		SIEVES	SUR. AREA	
PASS	RET.	CONSTANTS	PASS	RET.	CONSTANTS	PASS	RET.	CONSTANTS	PASS	RET.	CONSTANTS	PASS	RET.	CONSTANTS
*Wash		% x 300												
*200	*Wash	% x 200	*200		% x 250	*200		% x 250	*200		% x 250	*200		% x 250
*100	*200	% x 120	*100	*200	% x 120									
						*80	*200	% x 115						
*80	*100	% x 75	*50	*100	% x 60				*40	*200	% x 80			
*50	*80	% x 55												
*40	*50	% x 36	*30	*50	% x 32	*40	*80	% x 50				*10	*200	% x 45
*30	*40	% x 27												
			*10	*30	% x 15	*20	*40	% x 20						
*20	*30	% x 18							*10	*40	% x 18			
*10	*20	% x 11				*10	*20	% x 11						
*3	*10	% x 5	*3	*10	% x 5	*3	*10	% x 5	*3	*10	% x 5			
*1	*3	% x 3	*1	*3	% x 3	*1	*3	% x 3	*1	*3	% x 3	*1	*10	% x 4

* Still remaining in suspension over 15 seconds and removed by elutriation
 * Sand passing 200 mesh but not removed by elutriation.

Note:—Value shown in tables #2, 3, 4 and 5, for passing *200 sieve applies to average dust. Will be in error for some materials.

Use table according to number of testing sieves used.
 Reducing number of sieves will reduce accuracy.

By sieve analysis determine the amount of each size of aggregate. Express in terms of percent of total. Multiply the percent of each size by the constant given for that size. The constant is the equivalent area in sq. ft. of one pound of material of that size. Add results and total will represent surface area of the entire sample in terms of sq. ft. per lb.

tated time and opportunity for the study of pioneer work under various conditions and methods of control. The facts and theories underlying the development of a revised formula may be more clearly understood if set forth in the order of their conception.

Many examples of successfully oiled roads indicated that the correct percentage of oil in a mixture might be anywhere from 3 to 10 per cent. A section was selected for analysis where the material had been plant mixed and hence accurately proportioned by weight in a modern batching hopper. During construction the aggregate was separated into two sizes; in one bin was the material from No. 3 screen (.263-inch opening) to dust, the other bin containing the aggregate passing one inch and retained on No. 3 screen. Complete field construction records were available which included sieve analysis taken twice each day with the dust content determined by elutriation.

During the work the proportions of fine and coarse aggregate had been changed and it was observed that an increase in the amount of fines (No. 3 to dust) required an increase in the amount of oil to maintain a consistent appearance. So it was surmised that the oil requirement was directly related to the surface area of the aggregate since surface area is the element that is most definitely affected by the degree of fineness of the mixture.

A thorough study was made of the work of others on surface area equivalents, and particularly the numerical values arrived at by the painstaking work of

Captain Edwards, of Toronto, Canada,* although the screen sizes used by Edwards did not correspond to the standard sieves in use in California and his calculations did not extend to any particles below No. 100 sieve. As the dust content has long been known to have considerable effect on the oil requirement, it seemed desirable to develop a ready method for assigning surface area values to unit weights of any size that could be measured, including the dust.

The size of opening in standard testing screens is known, hence by plotting the reciprocals of these screen sizes as abscissas and the surface area values as ordinates, the resulting straight line graph forms a basis from which surface area equivalents may be assigned to any size group of particles. See Fig. I.

Further investigation indicated that the oil coverage factor (amount of oil for one square foot of surface area) is not a constant but varies with the size of the particles. After considerable research and much interpolation a series of curves shown in Fig. II were developed to take care of the relationship between film thickness and particle size.

TWO FACTORS SHOWN

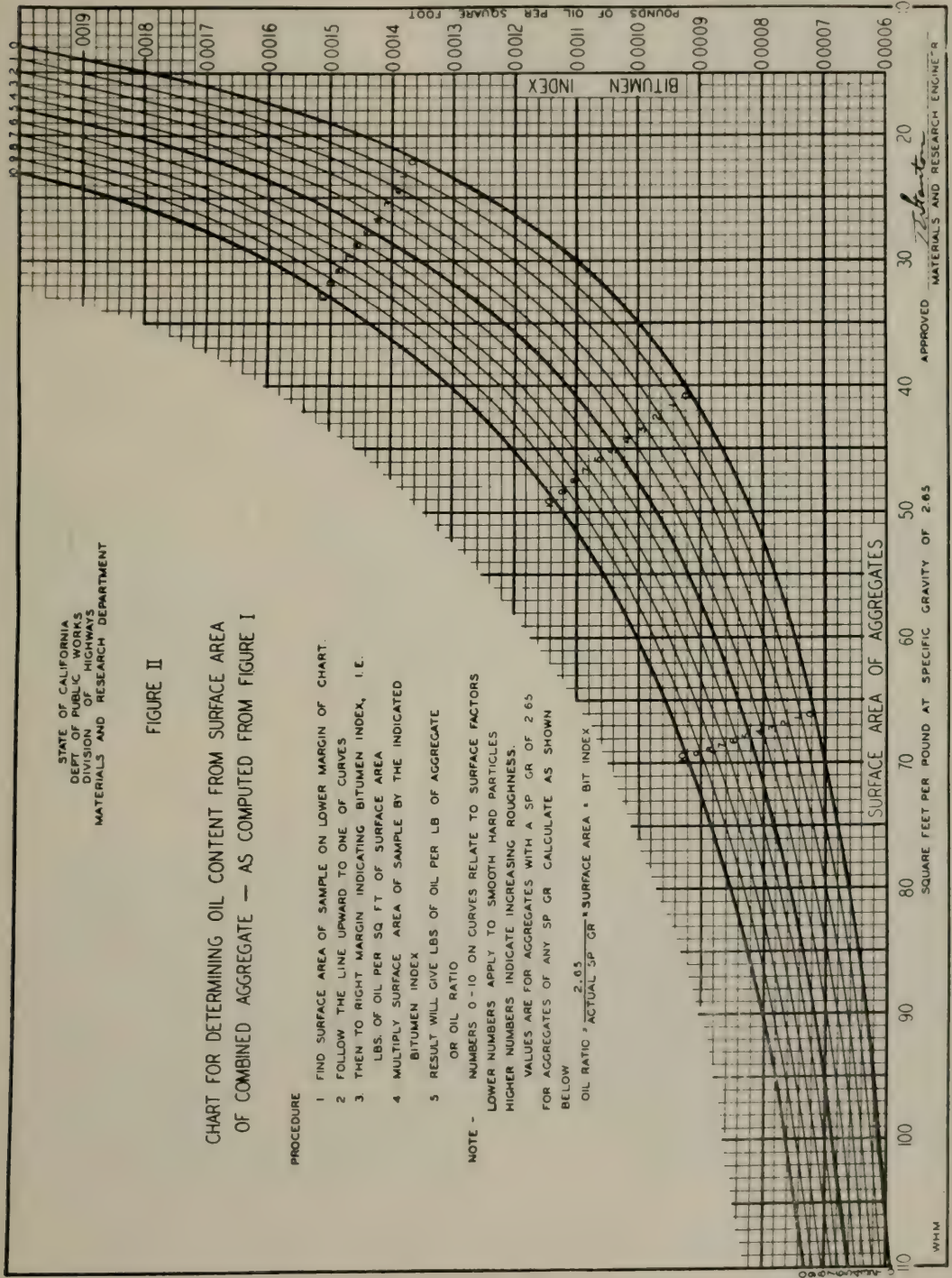
These curves reflect the theory that the proper amount of oil in any mixture of different sized particles depends, first, on the surface area, and, second, on the fact that the average film thickness for similar aggre-

* Proc. A. S. T. M. Vol. XVIII, Part II, 1918.

(Continued on page 22)

Chart for Determining Oil Content

(Continued from preceding page)



Morgan Keaton New Assistant Deputy Director Takes Office

MORGAN KEATON of Long Beach, a former assemblyman and a former State adjutant of the American Legion, was appointed Assistant Deputy Director of the Public Works Department by Governor Rolph on November 9th to fill that vacancy on the department staff.

Mr. Keaton has been engaged in the real estate and insurance business in Long Beach where he has also taken a prominent part in civic affairs. He was elected assemblyman from the 76th district in 1926 and served in the 47th Legislature from 1927 to 1929. He is married and has three children.

Born in Virginia, Mr. Keaton attended Roanoke College and then went to Washington and Lee University for a four-year pre-legal course, majoring in political science and political economy.

SERVED IN WORLD WAR

In 1916 he enlisted in the First Minnesota Infantry for service on the Mexican border and in 1917 he entered the first officers' training camp at Fort Snelling, Minn.

Commissioned a second lieutenant, he was assigned to the 88th Division and served in France during the World War. Soon after returning to America he came to California and established a residence in Sacramento in 1920 where he engaged in general real estate business.

He was appointed adjutant of the American Legion, Department of California, in 1921 and served three terms in that office from 1921 to 1924.

Absent Treatment Preferred

Boxing Instructor (after first lesson): "Now, have you any questions to ask?"

Beginner (dazed): "Yes; how much is your correspondence course?"—*Georgia Highways*.

Takes a Lot

Two trains of materials, of more than 50 cars each, are required to build a mile of concrete road, according to Arizona Highways, official publication of the Arizona State Highway Commission.

A State of Uncertainty

He: "This darn self-starter won't work. There's a short circuit somewhere."

She: "Well, why didn't you lengthen it, dear."

—*Motor Trader*.

Bixby Bridge, With Longest Concrete Arch, Is Completed

By W. A. DOUGLASS, Assistant Construction Engineer

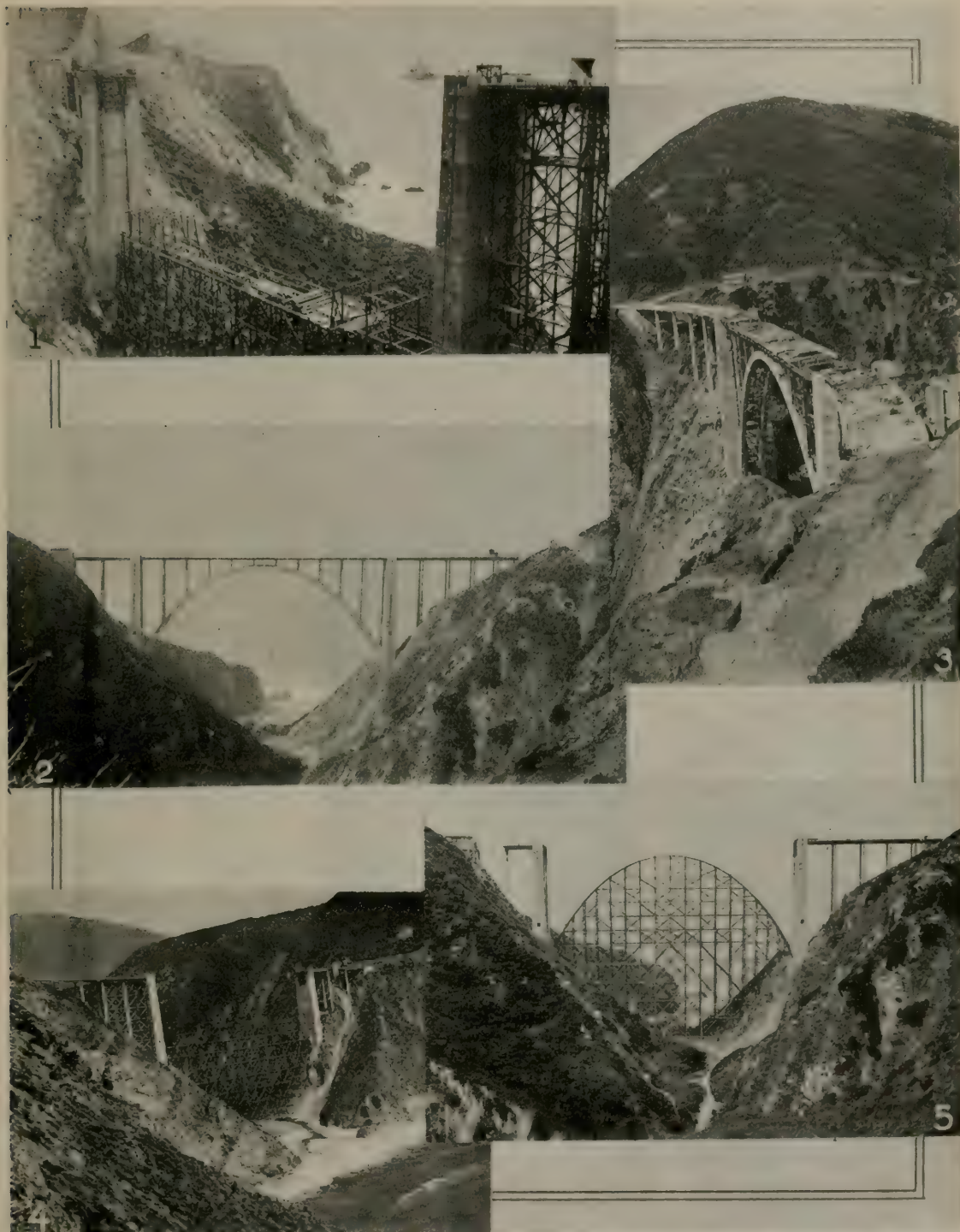
TRAVELERS from inland states, photographers and thousands of tourists have made famous such scenic roads as the Columbia River Highway in Oregon and the Redwood Highway in northern California. Another section destined for wide publicity and to attract heavy tourist travel is that extending from Monterey, the early California capital, southerly along the rugged Monterey coast to Morro Bay, and a connection with the main San Francisco-Los Angeles highway at San Luis Obispo. While an unconstructed stretch of 20 miles in southern Monterey County prevents through travel, steady progress is being made on new construction and realignment of old roads and within a few years this route will provide an alternate between Salinas and San Luis Obispo by way of Monterey.

Notable in the construction of this coast road is the series of arch bridges crossing the steep canyons high above sea level, yet within a stones throw of the breakers. Longest of these arch bridges—in fact the longest concrete arch yet constructed in the western states—is the Bixby Creek arch, 18 miles south of Carmel. The arch springs from heavy concrete abutments securely anchored in rock on the precipitous slopes of the canyon nearly 140 feet above the creek, and rises another 120 feet to span the 342 feet from center to center of abutments. The arch ribs which appear in the pictures to be thin and rather fragile, are actually five feet thick at the crown, nine feet at the springing line, and each four and one-half feet wide. The three 40-foot approach spans on the south and the six 40-foot spans on the north, bring the total length of bridge to 714 feet. Over 6600 cubic yards of concrete—860 in the arch ribs alone—600,000 pounds of reinforcing steel and 4700 cubic yards of excavation were the principle items in the contract. During construction the contractors transported materials, equipment and men across the canyon on platforms and slings suspended from a high line cable 300 feet above the water.

With the broad open exposure to high winds from the ocean, the problem of raising and holding the falsework for the arch ribs was unusually difficult. The contractor chose to avoid as much as possible of the risk by postponing erection of that span until danger of severe winter storms had passed.

The bridge was completed October 15th and by making use of temporary narrow road at the north, may be opened to traffic. A bridge across Rocky Creek a half mile north of Bixby will be completed about December 1st. At that time a connection between the present road and the new road will permit use of both bridges as well as several miles of new grade on the south, and will substitute a section of modern high speed highway for many more miles of narrow mountain road with steep grades and sharp dangerous curves. Another long stride in the Monterey coast road.

A bee can rise with three times its own weight, says an insectologist. Yes, and sit down with about 300 times its own weight.—*Thomaston Times*.



A CONCRETE RAINBOW ARCH, the longest in the West, now throws its graceful span across Bixby Creek on the San Simeon-Carmel highway. Progressive steps in its construction are pictured above. Nos. 1 and 4 are different views of the falsework as it was being built up from the canyon floor. No. 5 shows the completed falsework, 260 feet high and in No. 2 is seen the completed rainbow of concrete with falsework removed. No. 5 is a top view of span and roadway before railings were added.

New Mental Hospital Master Plan Adopted for 6000 Patient Capacity

By **GEORGE B. McDOUGALL**, A. I. A., State Architect

THE site known as the Lewis Ranch consisting of 1600 acres in Ventura County was selected for a new State hospital for insane on April 29, 1932. The site is situated 1½ miles from the town of Camarillo which is 17 miles south of Ventura and 56 miles north of Los Angeles on the Coast Highway.

Between May 11th and June 11th of this year Doctor J. M. Toner, Director of the State Department of Institutions, Doctor Herman Adler, consulting psychiatrist of the department, Paul Norman, secretary and the State Architect visited among other institutions 11 State hospitals for the insane in the eastern states to obtain first-hand information as to the latest development in such institutions.

Following return from this trip tentative preliminary sketches for a master plan for the ultimate institution and for the first unit for patients were started and modified from time to time until after eight different conferences both at the site and in Sacramento, the last one held at the site on October 5, 1932, these preliminary studies were approved and adopted.

GROUND-BREAKING IN MAY

Working drawings and specifications as required for bids are now being made and will be completed so as to permit of advertising for bids by March 1, 1933. It is expected that the ceremony of turning the first shovelful of earth at the site can be held May 1, 1933, the institution to be ready for the reception of patients in the Spring of 1934.

In the meantime provision has already been made for the housing of 50 patients in the existing wood frame buildings. These patients will be employed in farming, grading for

roads and similar work that will contribute to their physical and mental health.

The preliminary work besides the development and approval of the preliminary drawings above mentioned has covered also a contour survey of the entire site, the layout of roads both on the site and to provide approaches to it, also sewage disposal, water development, flood control, steam plant and gas and electric services.

While the working drawings and specifications for the portion of the first unit for patients now to be built are being completed and bids taken work will be gotten under way on building of roads and the development of the water supply system.

SIX THOUSAND ULTIMATE CAPACITY

The perspective view accompanying this article shows a group of buildings which will ultimately have a capacity for about 2000 patients. The portion to be built with funds at present available will have accommodations for 800 patients; one ward however will be used temporarily for 100 attendants so that the initial patient capacity will be for 700.

The master plan indicates that the ultimate institution will house 6000 patients and about 1000 employees. Of these 6000, 4000 will be in the classification of continuous treatment or custodial patients, and 2000 in the classification of curable patients.

In the provision for curable patients there will be included besides the ward and single room accommodations required, the diagnostic and hospital group which will provide all the services for classification, diagnosis, and hospitalization for both sexes as well as rooms for laboratory and research work.



GEORGE B. McDOUGALL



JUST THE BEGINNING of one of the greatest institutions in the Nation for State care of the mentally sick is shown in this architect's perspective of the first group of buildings provided in the master plan adopted for the new State hospital near Camarillo in Ventura County. The estimated cost of these initial buildings is \$700,000. The remainder of the \$1,000,000 available fund will go for furnishings, equipment and development of grounds.

EMPLOYEES QUARTERS

The configuration of the portion of the site which is to be used for the structures composing the main institution is such as to permit of the housing of all the employees, who as already stated may ultimately number 1000, on a separated but nearby area lying higher than the patients' groups. While the employees will be accessible to the patients, their homes and living quarters will nevertheless be isolated from them. The community life of the employees can be developed along the desirable lines of any well regulated community. Building provisions for this community life are included in the master plan and will be made as the institution grows and funds are provided.

The plan scheme of the patients' structures involves the use of a connected group of one- and two-story ward units gently rising with the natural contours of the ground and enclosing a large central plaza or court and 12 smaller courts. There will be a total of 22 wards in this 2000-patient unit.

SEGREGATION PLANS

Each group for 2000 patients is to have its own feeding unit and its own industrial unit; also a hospitalization unit, administration quarters and apartments for officers.

Besides having access to the large central court, each ward will have access also to two of the smaller courts thus making possible a maximum number of segregations for the various types of patients. Two-thirds of the patients in the group will be housed on the first floor and one-third on the second.

The architectural style of the entire group will be in keeping with the California adaptation of the Medi-

terranean styles of Spain and Italy and the one- and two-story arrangement besides promoting picturesqueness, homlikeness and architectural effectiveness, will give the patients the freest access to the outdoors of the courts. All of the courts are completely enclosed thus providing control against possible escapes of patients without interfering with their freedom.

THERAPEUTIC COLOR SCHEMES

Very careful attention is to be given to the color schemes both on the exterior and interior of the buildings and also to the landscaping of the grounds of the entire institution but particularly of the large central court and the smaller courts in the patients' quarters in order to get the largest possible therapeutic value into the surroundings in which the patients live.

All spaces within the buildings will be of ample size, the corridors will be wide and there will be abundant natural light and ventilation throughout.

All the most modern electric and other devices for the control and comfort of the patients will be provided. The principal interior spaces will be acoustically treated to avoid sound reverberation.

The service group including steam plant, laundry, bakery, commissary, store house, general garage, etc., is provided for on the master plan and will be built around a court enclosed by the various units. This court will be used for the storage of surplus materials and other accumulations resulting from the operation of the hospital which will thus be available for reuse when needed and in the meantime will be out of sight.

ONE MILLION DOLLARS AVAILABLE

The construction will be of reinforced concrete frame, reinforced concrete and brick exterior walls

(Continued on page 40)

Maximum of Pay Goes to Family Purse

(Continued from page 1)

As in the past two years, men with families who live in the locality will be given the work. The Division of Highways contacts the local officials or relief agencies and selects men adaptable to the work from lists furnished by them. The men live at home, board themselves and are paid \$4 per day. The State furnishes transportation to and from the work, the trucks going out on the State's time and returning on the men's time.

This method of supplying relief by expanding maintenance work has proven to be most satisfactory as through it a maximum of money expended goes directly to the men.

It is estimated that this year seventy-five cents of every dollar spent on this type of maintenance work will go to the men as wages and twenty-five cents will go for transportation, supervision and supplies.

Of the \$1,500,000 expended last year under the direction of the maintenance engineer 84 per cent was paid out in wages to the men but as the work nearest the base of operations has been completed the cost of transportation to and from the work rises and it is estimated that this year the cost of operation will increase nearly 9 per cent.

The type of work performed by these expanded maintenance crews is selected on the requirement of a maximum amount of hand labor and a minimum amount of material. The classes of work which lend themselves to these requirements include the following:

CLASSES OF WORK

Clearing gutters and roadsides; widening roadway curves, fills and cuts; improving roadway shoulders; removing slides and filling sinks; improving drainage by extending culverts, installing sub-drains and constructing rock gutters; cultivating and trimming trees and setting out ice plant to protect cut and fill slopes from erosion.

These various classes of work secure a maximum benefit from the funds expended, and add to the capital investment in the State's highways, while not materially reducing work necessary in regular maintenance operations. Under normal circumstances much of the work performed would be deferred for a considerable time, if carried out at all.

The results obtained are most satisfactory as they provide permanent improvements to the roads and serve the purpose of carrying many families through the winter when work in many lines has slackened.

The unemployment relief camp established by the Highway Division in Los Angeles County will care for 250 men through the winter. Southern California is faced yearly with a large population of homeless laborers and such a camp can only care for a small portion of them. The men are housed and fed for six hours work a day.

FOR HAND LABOR

The phase of relief based upon the \$4,600,000 in Federal aid funds which have been made available to

California will likewise have a far-reaching effect in alleviating unemployment conditions this year. These funds are subject to the regular Federal stipulations of the percentage of the work for which the government will pay and to further provisions requiring the use of hand labor methods where they are compatible with adequate construction.

The Emergency Relief and Construction Act was approved by the President on July 21, 1932, and the Division of Highways immediately laid plans for the construction of projects which were eligible for this advancement of Federal funds. That the State highway construction program has been pushed ahead with all possible speed is evidenced by the fact that to the present time 20 projects, estimated to cost \$3,418,200 have been advertised or let to contract and it is planned that 12 additional projects aggregating \$1,885,400 will be advertised by December 1st.

The following summary and detailed list of these projects show clearly their present status, location, mileage and the types of construction which they include.

EMERGENCY CONSTRUCTION HIGHWAY PROJECTS SUMMARY

Awarded and Advertised

Type	Miles	Amount
Concrete Pavement.....	34.6	\$1,359,100
Bituminous Treated Crushed Rock Surface	8.5	342,500
Untreated Crushed Rock Surface.....	6.3	82,800
Graded Roadbed.....	5.4	327,900
Bridges	(11)	1,305,900

Subtotals 54.8 \$3,418,200

Proposed for Advertising by December 1, 1932

Concrete Pavement.....	33.0	\$1,631,400
Bituminous Treated Crushed Rock Surface	4.3	52,000
Graded Roadbed.....	6.3	102,000
Bridges	(1)	100,000

Subtotals 43.6 \$1,885,400

Total Emergency Construction Highway Projects to be under way by December 1, 1932..... 98.4 \$5,303,600

These emergency construction projects together with the expansion of maintenance forces and the establishment of the highway and forest construction camps are the means by which the Department of Public Works and the California Highway Commission are meeting the unemployment situation. Thousands of California homes will be kept intact through the winter as a result of this comprehensive program and other thousands of homeless laborers will be cared for through another trying season.

Doctor: Exercise is what you need, my man; what do you work at?

Patient: I'm a bricklayer.

Doctor: Lay an extra brick every day.

Eric Cullenward Takes Office as New Deputy Director of Public Works

ERIC CULLENWARD, former Los Angeles newspaper editor and chief of the State Bureau of Documents and Publications, was appointed by Governor Rolph on November 9th to fill the vacant post of Deputy Director of Public Works and immediately took over the duties of his new office, the third position filled by him in the State government in seventeen months.

Mr. Cullenward's rapid climb to this office of responsibility as assistant to Director Earl Lee Kelly in managing the important affairs of the Department of Public Works began with his appointment to the secretaryship of the State Highway Commission. He was drafted from this position by Governor Rolph to organize and manage the new bureau created by the last Legislature to supervise the issuance and economical distribution of State publications.

As secretary of the Highway Commission Mr. Cullenward gained an intimate knowledge of the work of the Division of Highways as well as the other Public Works divisions that especially qualifies him for his new office.

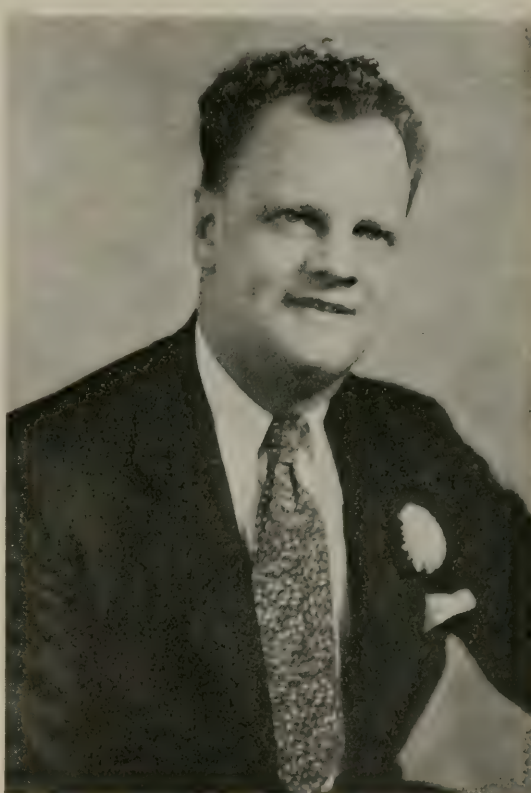
Mr. Cullenward had a long and successful career as a newspaper man before coming into public life. Starting as a young reporter in San Francisco, he rose through all the grades of that exacting profession to the rank of managing editor of the *San Francisco Examiner*.

Transferred to the *Los Angeles Examiner* as day managing editor he remained with that paper throughout the rest of his newspaper career in Los Angeles until his entrance into official life in Sacramento.

Mr. Cullenward is married and has three sons, two of whom have won distinction for their athletic prowess in Los Angeles where both of them are now attending school. One son is a promising member of the Freshman team of the University of Southern California and the other is winning honors on the Los Angeles high school team.

Small Girl Friend (to eight-year-old son of auto salesman): "Oh, I think you're lots better looking than your daddy."

Son: "I ought to be. I'm a later model."—*Georgia Highways*.



ERIC CULLENWARD

EARL LEE KELLY APPOINTED DIRECTOR OF PUBLIC WORKS

(Continued from page 2)

house and his small office because he was a one-man firm and couldn't afford another machine. From this small beginning he developed a business that caused his competitors to propose an amalgamation and made him president and general manager of the largest abstract and title business in northern California.

In addition to becoming a leading business figure Mr. Kelly took an active and prominent part in the civic and political life of Redding, serving both as a member of the City Council and as Mayor. He is a charter member of Shasta Post No. 197 of the American Legion of Redding.

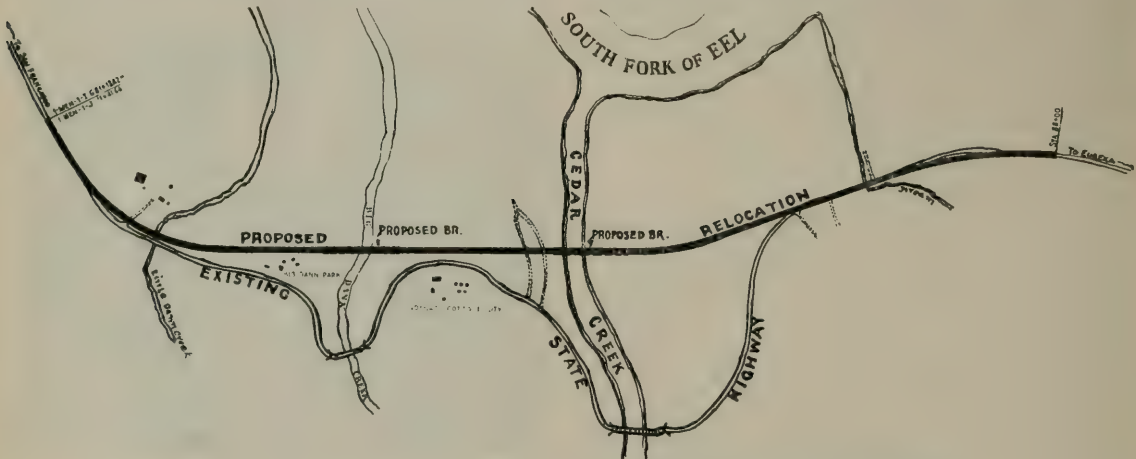
Redwood Highway Improvement Contrasts Old and New Standards

By F. N. DRINKHALL, Locating Engineer, District I

IN THESE times when we are prone to look backward and heed our neighbor's wistful remark about the "good old days," we can help spread a more optimistic outlook by contrasting conditions of today in our own field of endeavor—highways—with those of the past. To those of us who are engaged in highway building it is more or less of an old story, for we are constantly visualizing betterments in existing roads, but even we can benefit by looking backward on those "good old days" and find a certain

than two miles and in traversing this distance the traveler will now turn through less than a half a complete circle on very flat curves in place of more than two whole circles on very sharp curves.

What a contrast we find in the standards of location and also in bridge construction. The old unsightly timber bridges are to be replaced with beautiful concrete structures designed to fit the natural woodland setting, appealing to the eye as well as being a necessary part of the highway.



Map showing relocation project from Little Dann Creek to Underwoods.

pleasure and pride in the thought that we have a hand in work that is creative and for the good of the future.

IDEAL IMPROVEMENT

Probably the best example in contrasts that we have in District I at this time is the project on the Redwood Highway from Little Dann Creek to Underwoods, in Mendocino County. The ultimate in betterment of alignment, grades and sight distance seems to have been secured by this relocation. The old road wound around in and out of the two creeks with curvature as sharp as 100-foot radii and grades up to 7.13 per cent. These are replaced with tangent alignment, easy grades and ample sight distance.

A distance of almost a half mile has been saved for traffic in a total distance of less

"FROM TREE TO BRIDGE"

The old bridges were built by the State in 1917 literally "from the growing tree to the finished bridge." A 40-acre tract of timber was bought near the site, a portable sawmill set up and bridge timbers cut and hauled to the bridges.

Contrast this with the modern structures that are now being built across these two creeks under the latest and most efficient methods known. The old bridge across Big Dann Creek consisted of a main span of 180 feet and approaches with an overall length of 240 feet. The new concrete bridge calls for one 320 open spandrel arch span and six girder approach spans with an overall length of 583 feet. At Cedar Creek there is a 135-foot timber span and approaches with total



"TAILORING FOR BRIDGES DONE HERE" might be an appropriate sign for this unique pattern shop in the woods of Mendocino County on the highway relocation project between Big Dann Creek and Cedar Creek. On this big platform the contractor lays out to actual size the form and falsework construction for half of each of the 320-foot arches for the two concrete bridges over the creeks, just as a tailor lays out a pattern for the cloth he is to cut.

length of 367 feet, while the new concrete bridge also uses one 320-foot open spandrel arch and six girder approach spans, with an overall length of 607 feet.

HIGH STRUCTURES

While the bridges are remarkable for the length of their main arch spans, they will also be noteworthy because of their height. The Cedar Creek bridge will be 225 feet above the bottom of the creek, while that across Dann Creek will be 185 feet above the creek, and the traveler in passing over them will be literally rolling through the tops of the giant Redwood trees which furnish a truly beautiful setting for these splendid structures.

The contrasts in engineering standards revealed by an inspection of the relocation plans will perhaps be exceeded by the contrasts in comfort, safety and beauty of landscape which the traveler will experience in passing over the completed project next year.

An interesting feature in connection with the construction of the concrete arch bridges

over Cedar Creek and Big Dann Creek is the arch layout platform used by the contractor. These arches, while of slightly different shape and rise, are of equal span, 320 feet. Both spans are high above the bottoms of the canyons. The slopes are steep and covered with loose material. Construction of falsework and forms in place therefore presented costly difficulties.

The contractor solved the problem by establishing a storage yard and plant on the high ground between the two bridges, performing all carpentry work under ideal conditions. From the yard the completed units of forms and falsework were transported to the bridge sites by industrial cars and highlines.

The full-size platform was built for the layout of one half the arch face. The two halves are symmetrical but a slight modification was necessary for the second bridge. This method is typical of the contract work as the yard plant includes aggregate bunkers, concrete plant, a blacksmith shop and a small sawmill.

Earth and Earthwork in Highway Construction—Soil and Treatment

By C. S. POPE, Construction Engineer

This is the second of a series of articles by C. S. Pope on soil investigations made by the Highway Division of the California Department of Public Works with reference to highway subgrades. The first article discussed early soil studies. This article deals with the treatment of adverse soils and the accepted conclusions and practice resulting from more recent investigations.

BEFORE proceeding further with the discussion on soils, it seems that a better understanding of the subject may be had by defining the classes of soil usually encountered in highway work which require special treatment.

Soils may be assumed to be composed of clay, silt, loam, and sand, or combinations of these materials with moisture present and its physical phenomena are directly related to the preponderance of one or more of the elements.

Clay may generally be considered as produced from two sources, that is, residual clays which are those formed in place and transported clays which are those which have been brought to the location where they are found from more distant locations. The definitions of these materials as given by the Bureau of Public Roads are as follows:

MATERIALS DEFINED

Clay—That portion of the soil sample which remains in suspension after eight minutes subsidence to a depth of 8 cm. from the surface of the liquid, but which is thrown down when a centrifugal force equal to 500 times the force of gravity is exerted upon the suspended material for a period of one-half hour.

Silt—That portion of the soil sample which passes a 200-mesh sieve and which settles out of a mixture of soil and water after eight minutes subsidence to a depth of eight cm. from the surfaces of the liquid.

Sand—That portion of the soil sample which passes a 10-mesh sieve and which is retained on a 200-mesh sieve and which settles out of the mixture of soil and water after eight minutes subsidence to a depth of 8 cm. from the surface of the liquid.

Suspension Clay—That portion of the soil sample which remains in suspension when a

centrifugal force equal to approximately 500 times the force of gravity is exerted upon the suspended material for a period of one-half hour.

SUBJECT TO TEST

As indicated in the first article on this subject, certain characteristics of soils herein-after described are now subject to test.

These characteristics are all more or less interrelated but the most important are freedom from volumetric change and stability of bearing power.

Subgrade Treatment—A most necessary condition to be obtained in a subgrade over which pavement is to be constructed is that it should be free from *volumetric* changes, and it appears that there are only three methods of securing this at present.

METHODS OF TREATMENT

The first method of treating adverse soil is the one in general use under which the subgrade is covered with a coat of gravel six inches to 12 inches in thickness, which has twofold functions. First, it protects the underlying soil from evaporation and maintains it in a condition of normal moisture. Secondly, it probably offers a somewhat elastic or springy base which absorbs in its particles such expansion and contraction as occurs in the subgrade, which movement, because of the relative uniformity of moisture content in a blanketed soil, is, no doubt, much less than in a subgrade not so protected.

The second method is to mix the gravel or sand in with the adverse soil, which has been found by various investigators to reduce the expansion and contraction almost in direct proportion with the amount of adulteration.

The third method is to place on the soil a thick layer of sand which is intended to act as a mulch and preserves the moisture con-

(Continued on page 33)

"The Indispensable Woman" Wins Post of Interim Directorship

WHILE much was being heard about "the forgotten man" in the political campaign just ended, a sudden change in the executive personnel of the Department of Public Works brought to public attention "the indispensable woman."

Between the departure from office of the former director and the appointment of his successor there was an interim of four days when that office was filled by Miss Myrtle V. Murray, "the indispensable woman."

This honorable appellation was given Miss Murray, secretary of the Department of Public Works, just prior to her appointment as interim director, when, according to press reports, her name was mentioned during a discussion of department personnel with Governor Rolph and it was generally agreed that "she is indispensable."

ONLY WOMAN DIRECTOR

Governor Rolph showed faith in this verdict by appointing Miss Murray, Director of the Department of Public Works with all the honors and emoluments of that office and she was sworn in October 10, 1932, the first and only woman director in the history of the Department. She carried on efficiently and successfully until October 14th when she resigned upon the appointment of Director Earl Lee Kelly.

This high honor came to Miss Murray as the result of her record of more than twenty years of efficient service in the State's employ under five governors and six directors.

Entering the service of the State as a girl in 1911, she became a stenographer in the Highways Division as the Department was then known. The staff then consisted of a chief engineer, an assistant and two stenographers.

WON PROMOTION

Miss Murray made such a success in her new job that when a call came from the Governor's office for another stenographer she was given the position.

Hiram Johnson was then Governor and Miss Murray served in his office and throughout the term of his successor Governor Stephens for eight years returning in 1921 to the newly organized Department of Public Works as its secretary which position she held continuously until her brief tenure of



MISS MYRTLE V. MURRAY

office as director. Upon her resignation from that office she was appointed Administrative Assistant and Secretary by Director Kelly.

HARRY A. HOPKINS MADE CHAIRMAN OF STATE HIGHWAY BOARD

(Continued from page 3)

During the war, as chairman of the West Side Oilfields Chapter of the Red Cross, he had charge of all civilian relief and handled over \$25,000 in administering funds in the flu epidemic when school, hotel, club and private buildings including his own home were taken over and used as hospitals.

He was an organizer, first secretary and president of the Taft Rotary Club, and has been connected with the Kern County Council of the Boy Scouts of America for ten years serving as director and president.

Mrs. Hopkins has taken an equally active interest in civic, and social life and has been honored with the presidency of the Woman's Club. She and Mr. Hopkins were schoolmates and graduated in the same class. They have two children, a son and a daughter.

Method of Determining Oil Content

(Continued from page 10)

gates diminishes as the average particle diameter becomes smaller.

These curves are, of course, empirical as to quantity values, having been established by plotting calculated oil coverage factors as ordinates against surface area equivalents as abscissas.

The curves show the relation between the average bituminous film thickness (Bitumen Index)* and the total surface area of a unit weight of aggregate. An increase in surface area is necessarily accompanied by a decrease in the average diameter of the particles and the allowable film thickness diminishes in the same direction.

The various curves (ranging from 0 to 10) are arranged to compensate for increased surface area of particles due to roughness or irregularities. If this variable could be measured it would be possible to apply the value as a correction to the theoretical surface area and use a single curve to determine the correct coverage factor. At the present time the surface factor is estimated by inspection of the aggregate and the proper curve is selected to correspond.

LUBRICATION PRINCIPLE

There is some difference of opinion as to the fundamental principles underlying this variation in film thickness according to diameter of particles. From observation in other lines of research (Ceramics for instance) it would appear that the mass of the particle has a direct bearing on the film of water that is retained. Reference might be made to Newtons "Directly as the Mass," etc. Whatever the cause may be, however, it is not considered that the results with oiled mixtures are sufficient proof that particles will all attract and hold surface films relative to their diameters.

The writer believes that instability of a bituminous treated pavement and lubrication of the mass are synonymous terms. Then since road oils and asphalts are viscous liquids, the principles of lubrication are in operation and it follows that small particles are more easily lubricated than heavy ones, there is a necessity for a diminished oil coverage in order to maintain stability as the particles decrease in size.

This naturally brings up the question as to the principles underlying stability of asphaltic mixtures but it is not desired at this time to enter into that rather extensive subject.

Since the development of the above method, the oil content has been calculated for several thousand samples and the results checked by field work. It is usually possible to select the correct surface factor curve by inspection of the aggregate.

METHOD DESCRIBED

Following is a description of the method for determining the correct amount of asphaltic oil or cutback asphalt to be used in mixed oiled gravel or crushed stone surfacing, as developed by the writer and used by the Materials and Research Department of the California Division of Highways:

In general, the method is based on analyzing the

material by sieving and determining surface area values from sieve analysis, with recognition of the following factors:

First—The correct oil content is directly related to the surface capacity of the aggregate. This surface capacity is affected by three variable factors, each of which may vary independently of the others.

A—Most important, is variation in surface area due to variation in grading. Small particles have a greater surface area than the same weight of large ones.

B—Variation in surface area due to shapes and character of surfaces of particles.

C—Variation in absorption capacity of different aggregates.

Second—It has been established that the oil film or coverage factor must vary according to the average size of the particles.

Surface area equivalents of a sample of aggregate may be determined from sieve analysis. The sample is sieved and the amount of each size expressed as a per cent of the total.

RESULTS OBTAINED

A constant is assigned for each size which represents the surface area in square feet per pound.

The percentage factor of each size is multiplied by the constant for that size, the results added give the surface area equivalent for the grading represented by the entire sample.

This method may be used in connection with any number of sieves. More accurate results are obtained with a large number of size divisions, particularly of the finer particles.

The results thus obtained represent a mathematical relationship between surface areas of different aggregate gradings.

Variation of surface area between different classes of materials of the same grading, due to differences in shape and surface characteristics of the particles, must at present be estimated by inspection until laboratory tests are perfected. Rough irregular particles have a greater surface area than smooth spherical ones.

DETERMINED BY TESTS

Variation in absorption must be determined by trial or laboratory tests. This variation is due to the capacity of different rock structures to attract and hold varying thicknesses of asphaltic residue on their surfaces.

At the present time the formula is applied as indicated in the table. (See table.) This table is compiled to permit of using either a full set of testing sieves or a smaller number; the table to be used depending on the number of sieves available. The dust content should be determined by washing through a No. 200 sieve or by elutriation.

Having arrived at the surface area equivalent for the grading represented, the amount of oil required is calculated by multiplying the surface area by the "Bitumen Index." The "Bitumen Index" is a factor indicating the amount of oil in pounds required to cover one square foot of surface area.

It has been established that the oil film or cover-

* This term was used by Mr. A. R. Ebberts. Proceedings Sixth Annual Conference "Asphalt Paving Conference," 1927, Circular No. 49.

Practice Recommended by Laboratory

(Continued from preceding page)

age factor must vary according to the average size of the particles.

The "Bitumen Index" chart gives the coverage factor range that may be applied to different surface area equivalents. It will be noted that in fine grading combinations which have high surface area equivalents, the coverage factor is smaller and the tolerance more restricted than in coarse combinations.

CORRECTIONS NECESSARY

Corrections are necessary for aggregates having a specific gravity greatly above or below 2.6. A lighter aggregate should require more oil by weight and a heavier rock will require less. In order to definitely determine and measure all the factors which may be present and correctly evaluate their effect on oil content and quality of mix, it is necessary to make a laboratory study of the material and furnish the field men with constants that are correct for the particular aggregate being used. Considerable difference in quality of results may be anticipated with different aggregates regardless of structural strength, resistance to abrasion, or grading.

To translate the oil ratio into terms of per cent of the combined mix, divide weight of oil by combined weight of aggregate and oil.

The "Bitumen Index" curves are numbered 0 to 10. These numbers are designated as surface factors or "curve numbers" and apply to rock surface textures of

varying degree of roughness. The lower curves apply to smooth particles and the higher curves indicate increasing roughness.

In application, when the desirable position in the graduated curves has been fixed for a certain grading of a given aggregate, the same relative position (curve number) is to be maintained for all gradings of that aggregate. This will enable the construction forces to adjust the oil ratio to conform to variation and changes in grading as it affects surface area.

SURFACE FACTORS

The laboratory recommends the surface factor (curve number) for each aggregate. This curve is used in the field in calculating the exact oil requirement of the material being used. A given surface factor applies as long as the aggregates are similar in quality to the sample tested at the laboratory.

The Surface Area Equivalent Chart can be used to indicate the general relative stability values of aggregate. Any material that requires the lower surface factors is usually not highly stable. The most satisfactory materials generally require oil curve line No. 3 and above. It is probable that any material or grading requiring a "Bitumen Index" below .0007 will be more likely to show distress in wet weather than if a heavier coverage factor could be used.

These last observations are general and do not apply in every case; exceptions will be noted to all the above.

(Continued on page 28)

Example Showing Application of Method

Assuming a sample graded as below having a recommended surface factor #5 and with a specific gravity of 2.40.

Standard Testing Sieve	Percent Passing	Using Constants from table I- Fig. I				Constants from table #4- Fig. I				
		Pass.	Ret.	Proportion each size	Surf. Area Constants	Surface Area of Sample	Proportion each size	Surface A Constants	Surface A Sample	
Wash	6	Wash	--	.06 x	300 =	18.0	}	.11 x	250 =	27.5
#200	11	200	Wash	.05 x	200 =	10.0				
#100	18	100	200	.07 x	120 =	8.4				
#80	20	80	100	.02 x	75 =	1.5				
#50	25	50	80	.05 x	55 =	2.7				
#40	29	40	50	.04 x	36 =	1.4	}	.16 x	18 =	2.9
#30	32	30	40	.03 x	27 =	0.8				
#20	36	20	30	.04 x	18 =	0.7				
#10	45	10	20	.09 x	11 =	1.0				
#3	60	3	10	.15 x	5 =	0.7	}	.55 x	4 =	2.2
#1"	100	1	3	.40 x	3 =	1.2				
				1.00				1.00		
Surface Area of sample in sq.ft.per lb. =						46.4	47.0			
(Error between tables will vary with different gradings)										

Referring to the chart, (Fig.11) it will be found that a surface area of 46.4 on curve number 5 gives a bitumen index of .00102 pounds (of oil per square foot). The product of surface area and bitumen index gives the oil ratio. As the surface area curves are based on a specific gravity of 2.65 and the sample has a specific gravity of 2.40 a correction will have to be made. Hence, $\frac{2.65}{2.40} \times 46.4 \times .00102 = 5.2$ = oil ratio or 100 lbs. of aggregate will require

5.2 lbs. of oil.

Sixteen Major Highway Projects Including Five Bridges Advertised

HIGHWAY construction projects estimated to cost \$4,095,300 were planned for advertising during the month of October by C. H. Purell, State Highway Engineer and Chief of the Division of Highways in his monthly report to the Director of the Department of Public Works.

This advertising program included 16 major projects composed of 11 road projects and five bridge projects. The road improvements cover work on nearly 58 miles of State highway and amount to an estimated cost of \$2,693,300. The five proposed bridge projects will involve the construction of six structures, estimated to cost approximately \$1,062,000. The work is distributed well over the State, the projects being located in 12 counties.

Rapid progress is being made in getting under way 40 odd projects to be financed with the aid of the \$4,600,000 Federal Aid funds allotted to California by the Emergency Relief and Construction Act. The Division has advertised seven of these projects, four of which have already been let to contract, and 12 more estimated to cost a total of \$3,144,800 are among the 16 projects planned for advertising in October.

The Division of Highways is bending every effort to expedite the advertising of projects eligible for federal aid highway work, that the State may avail itself of this emergency construction money within the time limit set for its advancement.

PROPOSED PROJECTS

Following are brief descriptions of a few of the important projects proposed for October advertising:

In San Diego County two improvements are proposed for the San Diego-El Centro lateral. These two projects plan the reconstruction of that portion of this important route between Chocolate Creek and Viejas Creek, a distance of approximately nine miles. The westerly portion of this improvement involves the relocation of the highway between Chocolate Creek and Alpine and the portion easterly of Alpine includes the

straightening of the alignment and improvement to the grade on the present location with a complete change of alignment at the crossing of Viejas Creek.

The new highway will provide a graded roadbed 36 feet wide and will be paved with Portland cement concrete 20 feet wide. Both the new grade and alignment will be up to modern standards of highway construction and the completion of these two projects will replace the worst portion of this highway between San Diego and El Centro. The easterly end of the improvement will connect with the new pavement on the south side of Descanso Mountain and the westerly end will connect with the new pavement now being placed between Bostonia and Chocolate Creek.

The modernizing of this lateral highway is an important factor to the future development of the Imperial Valley and the proposed improvements, together with the many miles of pavement which have been placed on this route in the past few years, will provide this fertile garden spot with modern highway facilities to the coast at San Diego.

COAST IMPROVEMENT

An important improvement to the inter-beach section of the Oxnard-Serra Highway is proposed at the intersection of the State highway with Culver Boulevard southeasterly of the beach town of Venice in Los Angeles County. A 40-foot Portland cement concrete pavement has just been completed on the section of this highway between Washington Boulevard and El Segundo and the proposed improvement will complete the work between these two points.

TWO GRADE SEPARATIONS

The proposed work consists of constructing two grade separations at this intersection. The two structures will be placed side by side and will carry Culver Boulevard and the tracks of the Pacific Electric Railway over the State highway. The structures will consist of steel plate girders on reinforced concrete abutments and will provide a clear roadway on the State highway 60 feet in

Work Advanced to Bids in October

The schedule of projects proposed by the Division of Highways to be advertised for bids during the month and prior to November 1 include 16 major highway projects in 12 counties with an estimated total cost of approximately \$3,755,300. These projects comprise 11 road jobs and five bridges covering some 58 miles of State highway located in 12 counties. Included in the list are 12 projects that will be financed with the aid of Federal Emergency Relief funds.

DETAILED LIST OF PROJECTS

County	Location	Miles	Type of Surface
*Los Angeles	Mountain View Rd. to Orange Ave.	4.3	Port. Cem. Con. Pave.
*San Diego	Alpine to Viejas Creek	4.4	Port. Cem. Con. Pave.
Los Angeles	Piru Creek to Gorman	11.9	Port. Cem. Con. Pave.
*Santa Clara	Oregon Ave. to Whisman Road	4.7	Port. Cem. Con. Pave.
*Santa Clara	Whisman Rd. to Lawrence Sta. Rd.	3.5	Port. Cem. Con. Pave.
*Alameda	Dublin to Castro Hill	6.7	Port. Cem. Con. Pave.
*Ventura	Hueneme Rd. to Little Sycamore Ca.	11.6	Port. Cem. Con. Pave.
*San Diego	Chocolate Crk. to Alpine	3.4	Port. Cem. Con. Pave.
*Merced	Merced to Merced Airport	0.6	Port. Cem. Con. Pave.
*Marin	Richardson's Bay to Sausalito	2.1	Asphalt Conc. Pave.
*Mono	Whisky Creek to Convict Creek	4.3	Bit. Treat. Crush. Rock
*Yolo	Across Yolo By-pass		Widen'g Yolo Causeway
*Stanislaus	Across Tuolumne River at Modesto		Steel and Conc. Br.
San Luis Obispo	Across Pico and Little Pico Creeks		2 Steel Str. Bridges
Los Angeles	Under Culver Bvd. and Pac. Elec. Tracks		Reinf. Conc. Overhead Crossing
Sacramento	In North Sacramento		Flood Gates in Levee

* Federal Emergency Relief Fund Project.

SUMMARY

Type	Miles	Amount
Concrete Pavement.....	53.2	\$2,641,200
Bituminous Treated Crushed Rock Surface.....	4.3	52,100
Bridges	(5)	1,062,000
Totals	57.5	\$3,755,300

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 OCT.-NOV., 1932 Nos. 10-11

A HIGHWAY VALUE

The public which uses the highway between Los Angeles and Bakersfield may view each step in new construction work with considerable satisfaction. A contract has just been let for paving the first unit, the amount being \$379,820, and the total cost of the road will be in the neighborhood of three millions of dollars.

But from the figures made public, no expenditure could yield a more handsome return to the people. It is estimated that the shortened road, the eliminated curves and the better grades will save the motor traffic an annual sum of \$1,369,000 in operating costs.

But that is only a part of the advantage in so far as the southern San Joaquin valley is concerned. The tortuous Ridge Route has resulted in deflecting the travel of thousands of tourists to the Coast route, and Bakersfield and Kern County have been distinct losers thereby. When the new highway is completed, reducing the mileage very materially and supplying an easy and safe highway, we shall note an immediate increase in travel between Bakersfield and the southern metropolis. That means that thousands of people will come into this valley who would otherwise travel the Coast route. And we have more than once published the illuminating figures as to the value to a community of each touring car passing through it. No investment made, then, within recent years, is going to yield a better return, both to the traveling public and to the valley points than the new highway which is now to be paved.—*Bakersfield Californian*.

She—"Now what are you stopping for?"

He—"I've lost my bearings."

She—"Well, at least you're original. Most fellows just run out of gasoline."—*National Motorist*.

Yolo Causeway Job Spreading Work to 20,000 Californians

FREQUENTLY we see staggering figures, compiled by someone with a flare for freak statistics, of the "end to end" lengths of materials used in various structures. Let us consider the possibilities of such figures on the 20-foot width to be added to the present $3\frac{1}{2}$ -mile-long Yolo Causeway 5 miles west of Sacramento.

If the separate pieces were laid end to end the lines would be as follows:

Timber Piling.....	30 miles
Redwood Stringers.....	56 miles
3" x 6" Redwood Flooring.....	290 miles
Pile Caps.....	$3\frac{1}{2}$ miles

The stringers will be fastened to the caps with drift pins for which it will be necessary to bore 13 miles of holes and 17 miles of bolts and pins will be used. Spiking down the flooring will require 800 kegs—over two carloads of nails. Nearly six million board feet of California lumber will be used—in terms of houses—enough for over 400 cottages or for a town of 2000 people. Incidentally the Causeway, if converted, would provide this imaginary town with 55 blocks of sidewalk and paved streets.

It is likely that already fifteen thousand to twenty thousand people in the State are benefiting directly and indirectly from the rush of work in the sawmills and woods, producing lumber for the Causeway. Producing materials for the ten thousands tons of asphalt concrete paving and the 300 tons of steel and hardware will affect hundreds more. The local benefit of the half million dollar job will be felt through the large erection crews and their dependents throughout the winter and till midsummer of 1933.

Incidentally Sacramentans will be able to travel westward and return without the hazard of the narrow, dangerous 21-foot Causeway which has become a bottleneck to automobile traffic.

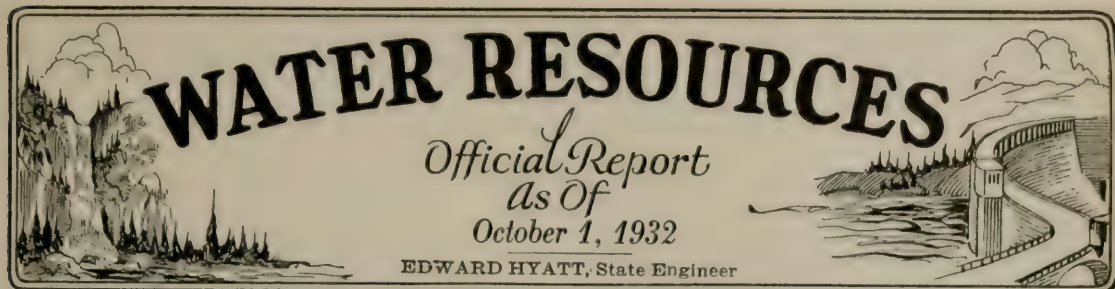
"Mother, Dad's brought home the new car."

"How do you know?"

"He got out to open the gate."—*Georgia Highways*.

Mrs. Bindler—"Is there any difference, Thomas, do you know, between a fort and a fortress?"

Mr. Bindler—"I should imagine a fortress, my dear, would be more difficult to silence."—*Tennessee Road Builder*.



An important Superior Court decision sustaining the right of irrigation district directors to change the plans after bonds have been voted; the employment of hand labor in cleaning drainage canals and by-pass areas; the approval of a program of bank protection on the Sacramento Flood Control project in cooperation with the Federal Government involving expenditure of \$100,000 by July 1, 1933, and details of other activities of the Division of Water Resources are among the interesting features in the regular monthly report of State Engineer Edward Hyatt as follows:

A decision of great importance to California irrigation districts was rendered by the Superior Court under date of August 29, 1932, and involves the authority of the directors of an irrigation district to make major changes in plans after bonds have been voted for the construction of a project. In the case in point, the El Dorado irrigation district, pursuant to Section 30 of the Irrigation District Act, employed an engineer to prepare plans and estimates for irrigation works. Based on the report presented by the engineer, the board of directors estimated that the sum of \$1,300,000 in bonds would be necessary to carry out the project. The report and estimate were submitted to the bond certification commission (now the California Districts Securities Commission) composed of the Attorney General, State Superintendent of Banks and State Engineer, as required by Section 30a of the irrigation act. The commission gave its approval and the bonds were voted on January 20, 1927. Thereafter \$600,000 in bonds were sold, the proceeds placed in the construction fund and the money expended. On December 20, 1928, a supplemental engineering report was submitted to the directors, approved by them and submitted to and approved by the bond certification commission. This report made certain major changes in the original construction plan; and thereafter an additional \$350,000 in bonds were sold and construction was continued under the modified plan.

COURT SUSTAINS BOARD

The question before the court was as to the legality of expenditures on the modified plan, and in summing up the court states in part as follows:

"The single question which is presented to us is whether the district had the power to use the funds derived from the sale of the bonds in accordance with a plan which differed substantially from that upon which the original estimate was based * * *. In considering the authority of the district and its directors, it should be remem-

bered that the legislative power over such districts is plenary, and that they might be formed and permitted to issue bonds without any vote of the electorate at all. There is no constitutional right of residents of such district to vote on bond issues. This right, however, is given to the electors by the California Irrigation Act * * *. It is urged by interveners that the resolution of the board, the notice of the election and the proposition placed upon the ballot incorporated the plan of the first engineering report so as to make any subsequent change a violation of a contract with the electors, and emphasis is also placed upon the publicity given the original report, which was distributed among the voters of the district. It is clear that the publication and distribution of such an informal report can not be deemed to limit the statutory powers of the board. The electors vote with presumed knowledge of those powers."

After discussing the points brought up in the case and citing decisions bearing on the same, the court finds that:

"The board had the power to proceed under the modified plan, and the obligations incurred thereunder were valid."

DELINQUENTS AIDED

The directors of the San Ysidro Irrigation District, San Diego County, have ordered the suspension for six months of the rule requiring the shutting off of water from users delinquent in their payments. This district furnishes domestic water for the town of San Ysidro, and for other communities near the Mexican border.

A recent trip was made over a portion of the mountain division of the Nevada Irrigation District for the purpose of inspecting certain work proposed for the protection of conduits against snow slides and for the installation of control work at the Milton heading. The Paradise, Butte County, and El Camino, Tehama County, irrigation districts were visited, in connection with proposals for the installation of measuring devices for water service. Visits in connection with information of their activities were also made to the Linden, San Joaquin County, El Dorado, El Dorado County, Glenn-Colusa and Princeton-Glenn-Codora, Glenn County, and Richvale, Butte County, irrigation districts.

A regular meeting of the California Districts Securities Commission was held on September 8, at its office in San Francisco.

The calling of an election for the submission of a \$409,000 refunding bond issue, under the refinancing plan of the Terra Bella district, was approved by the commission. Under an agreement with the bondholders this issue will be exchanged for \$818,000 outstanding bonds of the district.

(Continued on page 30)

Highway Bids and Awards for September

EL DORADO COUNTY—Between Placerville and the Railroad Crossing, about 1.7 miles, to be treated with fuel oil and cut-back asphalt. District III, Route 11, Section D. Tiffany, McReynolds & Tiffany, San Jose, \$4,223.30; Hemstreet & Bell, Marysville, \$4,792.25. Contract awarded to C. W. Wood, Stockton, \$4,086.50.

FRESNO COUNTY—Between Fancher Creek and Fresno, 2.7 miles to be graded and paved with A. C. District VI, Route 4, Section B. Peninsula Paving Co., San Francisco, \$98,925.50; Valley Paving Const. Co., Fresno, \$104,103.65; Griffith Co., Los Angeles, \$99,400.50; Hanrahan Co., San Francisco, \$88,602.50. Contract awarded to Union Paving Co., San Francisco, \$83,526.80.

LOS ANGELES COUNTY—Between Washington Boulevard and El Segundo about 4 miles earth shoulders to be treated with oil. District VII, Route 60, Section C. William Ward, Los Angeles, \$2,770; H. E. Cox & Son, Pasadena, \$2,900; Pecos H. Calahan, Glendale, \$3,000; L. A. Paving Co., Inc., Los Angeles, \$3,000; Oilfields Trucking Co., Taft, \$3,420. Contract awarded to Southwest Paving Co., Los Angeles, \$2,720.

LOS ANGELES COUNTY—Between 13 $\frac{1}{2}$ and 15 miles north of Castaic, 4 deck plate girder bridges to be constructed. District VII, Route 4, Section I. Herbert M. Baruch Corporation, Ltd., Los Angeles, \$169,884.43; Sander Pearson and Dimmitt & Taylor, Los Angeles, \$212,220.60; Neves & Harp, Santa Clara, \$190,105.25; Bodenhamer Construction Co., Oakland, \$197,513.20; Gist & Bell, Arcadia, \$179,019; Obert Bros., Los Angeles, \$182,316.10; Lynch Cannon Engineering Co., Los Angeles, \$174,259.30; Sharp and Fellows Contracting Co., Los Angeles, \$165,397. Contract awarded to Weymouth Growell Company, Los Angeles, \$154,611.55.

MENDOCINO COUNTY—Between Little Dann Creek and Heagneys, about 1.8 miles to be graded and surfaced with crusher run base and about 4.5 miles to be surfaced with uncrushed gravel or stone. District I, Route 1, Section J. Chigris and Sutsos, San Francisco, \$83,689; Hein Bros. Basalt Rock Co., and J. V. Galbraith, Petaluma, \$86,006.75; Clyde W. Wood, Stockton, \$87,270.50; Hemstreet & Bell, Marysville, \$88,877.50; E. B. Bishop, Sacramento, \$79,468.05. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$78,943.75.

MONO COUNTY—Constructing a workman's cottage at Sonora Junction Station. District IX. J. W. Stewart, Bridgeport, \$2,398; T. Johanns, San Francisco, \$2,488; C. J. Sumner, Lone Pine, \$2,665. Contract awarded to F. M. Banta, Bishop, \$2,100.

MONO COUNTY—Between West Walker (Canyon) River and 2 miles south of Coleville, 2.4 miles to be graded. District IX, Route 23, Section K. Tiffany, McReynolds & Tiffany, San Jose, \$11,717.20; Harms Bros., Galt, \$9,721.70; F. G. Smith & F. D. O'Neal, Long Beach, \$11,279.60; Geo. Herz & Co., \$15,681.50; Larson Bros., Galt, \$9,329.10; Isbell Construction Co., Carson City, Nevada, \$12,346; Robinson Roberts Co., Los Angeles, \$13,573.30. Contract awarded to Oilfields Trucking Co., Taft, \$8,516.70.

MONTEREY COUNTY—Between San Remo Divide and Carmel River, 3.7 miles to be graded and surfaced with selected material and bituminous binder. District V, Route 56, Section H. Von der Hellen & Pierson, Castaic, \$129,954.35; Clyde W. Wood, Stockton, \$147,219.40; M. J. Bevanda, Stockton, \$132,417.70; E. C. Coats, Sacramento, \$130,357.20; S. H. Palmer & J. P. Holland, Inc., San Francisco, \$139,179.20; Merritt-Chapman & Scott Corporation, San Pedro, \$127,561.60; Fred W. Nighbert, Bakersfield, \$163,044.05; D. McDonald, Sacramento, \$134,844.85; Force Construction Company, Piedmont, \$158,649.90. Meyer Rosenberg, San Francisco, awarded contract, \$123,886.42.

MONTEREY COUNTY—Between San Ardo and San Lucas, about 4.6 miles in length, bituminous surface treatment to be applied. District V, Route 2, Section G. Clyde W. Wood, Stockton, \$15,390; M. J. Bevanda, Stockton, \$15,903; H. E. Cox & Son, Pasadena, \$17,632; U. B. Lee, San Leandro, \$15,561; W. A. Dontanville, Salinas, \$19,013.30; Oilfields Trucking Co., Bakersfield, \$18,929.70; Fred W. Nighbert, Bakersfield, \$16,843.50; Peninsula Paving Co., San Francisco, \$16,904.30. Con-

tract awarded to Granite Construction Co., Ltd., Watsonville, \$13,547.

SAN JOAQUIN COUNTY—Construction of Stockton Maintenance Station buildings. District X. C. J. Hopkinson, Sacramento, \$8,724; J. F. Shepherd, Stockton, \$7,916; Luigi Cosentino, Dunsmuir, \$8,500; Theo. Johanns, San Francisco, \$8,800; Alfred H. Vogt Co., Inc., San Francisco, \$9,390; H. H. Henning, Stockton, \$7,777; Ecker & Stegmiller, Stockton, \$8,952; Frank P. Guyon, Stockton, \$8,575; C. H. Dodd, Stockton, \$8,237; J. Witzelberger, Woodland, \$7,924; Thos. J. Doyle, San Francisco, \$7,971. Contract awarded to J. J. Cavanagh, Stockton, \$7,670.

SANTA CRUZ COUNTY—Between Inspiration Point and Scotts Valley, 5.9 miles to be graded. District IV, Route 5, Section B. Hemstreet & Bell, Marysville, \$384,224.95; C. W. Wood, Stockton, \$286,468.45; Isbell Construction Co., Carson City, Nevada, \$459,026; Peninsula Paving Co. and J. P. Holland, Inc., San Francisco, \$289,013.35; Merritt-Chapman & Scott Corporation, San Pedro, \$348,103.05; VanderHellen and Pierson, Castaic, \$316,138.10; Porter Bros. Corporation and Robert P. Porter, San Francisco, \$333,324.03; M. J. Bevanda, Stockton, \$331,225.50; The Utah Construction Co., San Francisco, \$543,157; George Pollock, Sacramento, \$346,464.50; Meyer Rosenberg, San Francisco, \$362,654.55; T. M. Morgan Paving Company, Los Angeles, \$357,135; Union Paving Co., San Francisco, \$358,722.15; Frederickson & Watson Construction Co., and Frederickson Bros., Oakland, \$364,995.80; D. McDonald, Sacramento, \$359,978.30; Granfield, Farrar & Cardin, San Francisco, \$351,705.60; E. G. Coats, Peterson & Isgren, Sacramento, \$312,268.20; Kern & Kibbe, Portland, Ore., \$356,574.80; Weymouth Crowell Co., and E. Penn Watson, Jr., \$341,846.10. Contract awarded to Mittry Bros. Construction Co., Los Angeles, \$280,181.75.

STANISLAUS COUNTY—7.9 miles A. C. pavement to be planned. District X, Route 4, Sections A, B. Asphalt Pavement Planing Company, Oakland, \$5,011.20. Contract awarded to Standard Road Planning Co., San Luis Obispo, \$4,008.96.

TULARE COUNTY—Between Lemon Cove and Three Rivers, 8.4 miles to be graded and surfaced with bituminous treated crushed gravel or stone. District VI, Route 10, Section E. Frederickson Bros., Oakland, and Jones & King, \$327,783.10; M. J. Beranda, Stockton, \$389,483.70; A. Teichert & Son, Inc., Sacramento and C. T. Malcom, \$368,014.35; Union Paving Co., San Francisco, \$399,959.60; Meyer Rosenberg, San Francisco, \$331,263.90; S. H. Palmer, San Francisco, \$369,810.70; Peninsula Paving Co., Inc., and J. P. Holland, San Francisco, \$324,518.60. Contract awarded to Thompson Bros., Fresno, \$299,789.85.

PRACTICE RECOMMENDED BY LABORATORY

(Continued from page 23)

In conclusion, it might be said that these curves are not necessarily ideal and it is not unlikely that changes in shape of curves (in other words variation in relative values) will be developed for variations in viscosity of liquids. The need for such change does not seem to be pressing in the oils and cutbacks but may be a future refinement.

It may also be of interest to state that the principle of variable film thickness on a surface area basis appears to be applicable to Portland cement concrete.

The water index curve is similar although not identical to the "Bitumen Index" curves. Water being necessary to produce workability in concrete, it would seem that the lubrication principle explains the analogy.

Happiness is a perfume you can not pour on others without getting at least a few drops on yourself.

Seven Thousand Square Miles Mapped in Cooperative Topographic Program

By EDWARD HYATT, State Engineer

ANNOUNCEMENT was made last November of the topographic mapping program which had recently been arranged between the Topographic Branch of the U. S. Geological Survey and the office of State Engineer, looking toward completion at the earliest practicable date of reasonably satisfactory topographic base maps of the remainder of California. It is gratifying at this time to announce that the program is well abreast of the schedule and advancing most satisfactorily.

The program adopted by the two cooperating parties proposed the mapping of some 75,000 square miles at an estimated cost of \$1,660,000, which at the current rate of expenditure would require some 14 years to complete. Of the 75,000 square miles then proposed for mapping some 7000 square miles have since been surveyed and the advance sheets on 3300 square miles are already published. The quadrangles completely surveyed include the following:

Anaheim No. 1, Anaheim No. 2, Anaheim No. 3, Anaheim No. 4, *Antelope Plain, *Barstow, Cloud, *Coal Oil Canyon, Downey No. 4, *Dunsmuir, *Etna, *Harvester, *Hayes Ranch, La Panza, Los Bolsas, *Lokern, *Lone Tree Well, No. 57, No. 65, Santa Ana No. 1, Santa Ana No. 2, Santa Ana No. 3, *West Camp, *West of Goose Lake, White River No. 2, White River No. 3, Yreka.

As evidence of the general distribution of this work it may be stated that during the year field surveys were made in 15 different counties of the State. The extent to which the work has been accelerated will be ap-

preciated by the following comparison of work done in the fiscal year 1931-1932 with that in the fiscal year 1930-1931:

Item—	Year 1930—	Year 1931—
	1931	1932
Field work—quadrangles surveyed----	10	29
Office work—quadrangles drafted----	10	16
Advance sheets—No. published----	17	15
Engraved sheets—No. published----	9	10
Vertical control—miles of levels----	0	1030

During the past year some experimentation has been carried on looking toward the evolution of new methods for expediting the work and decreasing the cost. The work on the Barstow Quadrangle was of this nature, it being representative of a large area in southeastern California on which considerable preliminary field work had already been done by the city of Los Angeles in connection with its Colorado River surveys. Work is now in progress on the Truckee and Colfax sheets in an effort to devise an economical method for revising culture and making desirable corrections on quadrangles previously mapped and published

by the Geological Survey. A test of aerial photographic methods is now in progress on the Lakeport sheet.

The State of California, through the office of the State Engineer, contributes 50 per cent to the cost of this work and shares proportionately with the U. S. Geological Survey the responsibility for determining a correct order of mapping, appropriate scales and the most economical methods. The progress which is being made with the adopted program is most gratifying.



EDWARD HYATT

(NOTE.—Names preceded by asterisk indicate quadrangles for which advance sheets are already published.)

\$100,000 Bank Protection Project

(Continued from page 27)

FLOOD CONTROL AND RECLAMATION

a. Maintenance of Sacramento Flood Control Project.

The irrigation of willows planted along the East levee of the Sutter By-pass for protection has been discontinued for the season. The pile driver crew has completed driving seven new bents in the Franklin Road bridge and the work of repairing the deck has been practically completed. Incidental repairs on a number of other bridges have also been made, principally replacing floor planking. Gates are now being placed on three bridges leading into the by-pass, to control the movement of sheep in the by-pass and on the levees.

HAND LABOR EMPLOYED

Cleaning of several of the drainage canals has commenced, the work consisting of removing the grass, brush and tules by hand labor. Fall maintenance clearing in the by-pass area began on September 19 with a force of 25 men. Several other crews will be put to work in the near future and the work will continue for approximately 75 days. It is expected that from 65 to 80 men will be employed.

The revetment along the south side of the Sacramento By-pass, where the current has a tendency to cut and undermine the concrete pavement, has been protected with a layer of cobbles. This work was started some time ago and was completed in this period upon delivery of the final order of cobbles.

For the purpose of keeping down the growth of young willows, 1661 goats have been pastured in the lower Sutter By-pass.

b. Sacramento Flood Control Project—Bank Protection.

Work has been completed on the emergency bank protection work done in cooperation with Reclamation District No. 1500 on the left bank of the Sacramento River at the Ely ranch. A length of 400 feet has been protected at a cost of \$1,800.

Maintenance work is being continued on the floating river construction equipment and one watchman is on the outfit at all times.

A program of permanent bank protection in cooperation with the Federal Government has been approved, involving the expenditure of \$100,000 by July 1, 1933. This program includes permanent rock protection at 13 places on the Sacramento River and Three Mile Slough, from Moulton weir to Rio Vista. On account of the lack of State money available for the purpose, the State will contribute only \$10,000 of the total amount for the first year's program. For future work the Federal Government will contribute twice the amount contributed by the State. The State's contribution for this year will consist of the construction of protection at Tyndall Mound on the Sacramento River about eight miles above Knights Landing.

c. Russian River Jetty.

During the last period a crew of 11 men has been

engaged continuously in quarrying and placing rock in the jetty. The rock wall is now practically completed to the steel trestle. The derrick has been moved in the quarry, which will make it possible to handle a large quantity of good rock at a low cost. Since operations commenced in June of this year, the average labor cost has been 75 cents per ton actually placed in the levee, including all work done on the job, involving structure and equipment repairs and maintenance of track.

d. Emergency Flood Protection and Rectification of Rivers.

Work has commenced on two small bank protection jobs on the Mad River in Humboldt County, in cooperation with the land owner, involving an expenditure of approximately \$2,000. Arrangements are being made for continuing channel rectification work on the San Jacinto River in cooperation with the San Jacinto Levee District.

e. Sacramento Flood Control Project.

Reports have been rendered on several applications before the reclamation board and work done under various applications has been inspected.

The reclamation board has authorized the expenditure of \$8,000 for clearing in the American River By-pass in connection with the construction of the North Sacramento levees. Work will be commenced immediately by force account.

f. Flood Measurements and Gages.

A new recording gage shelter and well have been installed on the Yuba River at Hammonton. In the office the work of collecting data and preparing reports on high water conditions for the past season and for all seasons up to date for which reports have not been published heretofore, has been continued.

WATER RIGHTS

Applications to Appropriate.

Twenty-four applications to appropriate water were received during the month of August; 15 were denied and 18 were approved. In the same period three permits were revoked and two licenses were issued. The essential data concerning each of the applications received and approved will be found elsewhere in this publication.

Field investigations of projects under permit were made during the month in Sacramento, Calaveras, Amador, El Dorado and Placer counties.

ADJUDICATIONS

Shasta River (Siskiyou County). Findings in accordance with the decision of the court are being prepared by the division.

Whitewater River (San Bernardino and Riverside Counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

River Flows Slowly Increasing

(Continued from preceding page)

Clover Creek (Shasta County). The Clover Creek case is pending in the Superior Court of Shasta County awaiting the court's pleasure in setting a date for hearing.

Butte Creek (Siskiyou County). Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Deep Creek (Modoc County). The schedule of allotments adopted by the water users for trial distribution during the 1932 irrigation season was administered by a water master throughout the month.

Franklin Creek (Modoc County). The schedule of allotments for trial distribution for the 1932 irrigation season was administered by a water master throughout the month.

Eagle Creek (Modoc County). The waters of Eagle Creek were distributed throughout the month in accordance with the plan for trial distribution adopted for the 1932 irrigation season.

WATER DISTRIBUTION

Burney, Hat, North Cow, Oak Run and Clover creeks (Shasta County). Water master service on these streams was continued throughout the month.

Little Shasta River and Lower Shasta River (Siskiyou County). Water master service on these streams was continued throughout the month.

West Fork of Carson River (Alpine County). Water master service on this stream was continued throughout the month.

Cedar, Davis, Deep, Eagle, Emerson, Franklin, Mill, New Pine, Owl, Pine and Soldier creeks and South Fork Pit River (Modoc County). Water master service on these streams was continued throughout the month.

Pit River in Big Valley (Modoc and Lassen counties). Supervision of diversions from Pit River in Big Valley continued throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Field work including measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, has continued during the past month. Apparently the minimum flow of the Sacramento River at Sacramento was reached about August 9th when the flow was 2000 second-feet. The flow has now increased to 2400 second-feet. The San Joaquin River at Vernalis continues to fall and the present flow which is the minimum to date, is 960 second-feet. The combined river flow to the delta is now about 3400 second-feet. If there were no consumptive use of water in the delta, this flow is just about the amount required to prevent salinity from encroaching into the delta. The actual irrigation consumption of water in the delta at the middle of September is, however, about 2700 second-feet. The total flow to the delta has therefore been insufficient to prevent salinity encroachment and

salinity of 100 parts of chlorine per 100,000 parts of water is now between Emmaton and Three Mile Slough Bridge in the Sacramento River and in the vicinity of Jersey in the San Joaquin River. With the consumption of water in the delta now decreasing and the flow of the Sacramento River slowly increasing, it is probable that the maximum salinity encroachment for the season in the Sacramento delta has been reached although there may be a further slight advance in the San Joaquin delta. The salinity at Emmaton on September 6th was 144 parts and on September 10 it had dropped to 120. The following tabulation gives a comparison of the salinity at some of the stations on September 10, 1932, and the corresponding salinity on September 10, 1931.

Station—	Salinity in parts of chlorine per 100,000 parts of water	
	9/10/32	9/10/31
Point Orient.....	*1680	1780
Point Davis.....	1520	1750
Bullshead	1320	1580
Bay Point.....	940	1460
Collinsville	400	1180
Antioch	*270	1100
Emmaton	120	970
Jersey	*68	800
Central Landing.....	8	250
Middle River P. O.....	9	250
Rio Vista.....	28	640

* September 6th.

In the field work, especial attention is now being given to obtaining the data on the acreage and crops under all river diversions and to the census of all irrigated crops and acreages in the delta.

CALIFORNIA COOPERATIVE SNOW SURVEYS

Routine field and office work has continued under this project during the past month. In the field the brushing out and re-signing of all courses in the South Yuba area were completed. A trip was made to complete arrangements and details of the surveys in the South Kings, Bishop, Mono, Tuolumne, Merced and upper San Joaquin River basins. In the Kings River Basin a shelter cabin is to be constructed to replace one burned down during the past winter. In the Bishop-San Joaquin-Kings basins manways are being constructed at Piute and Bishop Pass cabins to facilitate finding and entry of the cabins during heavy snow conditions. This was proven to be badly needed on the surveys in March, 1932. In the Merced River Basin the Snow Flat snow course has been changed to the original Snow Flat about one mile east of the former location. This is in Yosemite National Park and this and all other snow courses in the park are surveyed in cooperation with the park service.

Office work has included the computations and maintenance to date of stream flow and precipitation tabulations, etc.

(Continued on page 38)

Two Grade Crossing Separations Among Projects Advertised

(Continued from page 24)

width. The construction of these two grade separations is to be undertaken cooperatively with the State, Los Angeles County and the Pacific Electric sharing in the cost.

In the report for September advertising proposed improvement to the Bay Shore Highway in Santa Clara County was noted. The additional funds provided for emergency highway construction projects made it possible to finance the paving of the section of this highway between Oregon Avenue and Lawrence Station Road where the project had been budgeted for grading and temporary bituminous treated crushed rock surfacing. To secure the best results the original project was divided and the grading and paving will be done under two projects.

A 60-foot graded roadbed with a Portland cement concrete pavement will be placed on each section.

REDWOOD HIGHWAY JOB

Another important improvement in the bay area is the proposed improvement of the southerly terminus of the Redwood Highway. This project proposes the grading and paving of this popular highway from the recently constructed bridge across Richardson's Bay into the town of Sausalito. This project involves the realignment of much of this portion of the heavily traveled Redwood Highway and the construction of a 56-foot roadbed and a 40-foot asphalt concrete pavement on a crusher run base.

In Stanislaus County a major improvement is to be made to the Los Angeles-Sacramento arterial at the southerly city limits of Modesto. This project provides for the construction of a 50-span steel girder bridge on concrete piers across the Tuolumne River. The total length of the structure will be 2050 feet and the concrete deck will provide a clear roadway 30 feet wide with two 5-foot sidewalks. This new bridge is to be placed on a revised alignment of this trunk highway through the city of Modesto.

WIDER CAUSEWAY

An improvement of vital interest to thousands of motorists will be the widening of the causeway across the Yolo By-pass just west of Sacramento in Yolo County. The

FOREMAN'S HEROIC AID SAVES LABORER'S LIFE

District Engineer L. H. Gibson of District V makes the following report:

"Quick thought and action on the part of Junior Highway Construction Crew Foreman L. A. Bartlett, employed by the Division of Highways at Convict Camp No. 22, on the Carmel-San Simeon Highway in Monterey County, probably saved the life of one of the convicts in his charge.

On a recent morning members of a crew of convicts were engaged in clearing the right of way about 12 miles north of Camp No. 22 on the Monterey coast when one of the convicts, while attempting to move a large rock, was bitten by a rattlesnake.

Mr. Bartlett who was a short distance away ran to the man's aid and slashed his wrist where he had been bitten by the snake, and without thought of any danger to himself, although his lips were cracked, sucked the blood from the wound and applied first aid treatment. The man apparently suffered very little ill effect from the bite due to the quick work of Mr. Bartlett."

AID FOR STABILIZATION

The 1932 annual report on Public Improvements and Tax Rate of the American Association of Engineers, says:

"Timed public works seem to offer the best means of aiding in the stabilization of industry and trade. The idea rests on the assumption that the only remedy for unemployment is employment, by concentrating the greatest volume of public construction in those years that would otherwise be lean.

present structure, located on the main artery between the State Capitol and the San Francisco Bay area, was constructed some 18 years ago and its roadway width of 20 feet was long considered ample, but with the present day heavy and fast-moving traffic the width of this trestle has become inadequate.

The proposed improvement will widen the structure on the southerly side with a timber trestle and the new roadway width will be 42 feet with a 3-foot sidewalk. The entire roadway width of the deck will be surfaced with asphalt concrete and the present bascule span at the easterly end of the structure will be replaced with a double leaf lift span. The total length of this causeway is 16,538 feet and its widening will greatly increase the safety to the large volume of traffic which daily travels this important artery.

Conclusions Drawn from Soil Studies

(Continued from page 20)

tent at what may be termed *normal moisture* content.

It seems that the problem has two or three phases. One is to so treat the soil that it retains the *normal moisture* content and, therefore, no volumetric change at all times and this theory will require that we abolish the "baked subgrade," and that subgrades at the time of laying concrete should be in a condition of normal moisture when pavement is laid. This phase does not necessarily insure proper bearing power.

The second general phase of the soil treatment is that sufficient bearing power should be provided to sustain the loads when the moist adverse soil is in a condition of normal saturation. The most notable failures in cases of this kind have been where the thickness of subbase provided for flexible pavement such as oil macadam or asphaltic concrete was not sufficient to distribute the loads imposed upon it over an area wide enough to decrease the pressure per square foot to safe proportions.

DRAINAGE CONSIDERATIONS

Both the experiments of the Illinois Highway Commission and the Bureau of Public Roads as well as our experiments indicate that a soil containing a considerable percentage of clay and having a high water holding capacity can not be drained by any means so far devised, and drainage, therefore, is not a cure for weak subgrade in some soils.

The construction of side drains may hold the water content at normal but can not decrease it, and it is, therefore, necessary to design a pavement not for a baked subgrade but for a subgrade containing a normal amount of moisture.

Conclusions—The studies so far made by various investigators of soil characteristics indicate that the following facts are accepted in relation to soils and sands and these determinations and conclusions are of value in this study.

1. The water-carrying capacity of sands is in inverse relation to the voids.
2. Volume shrinkage in clays is proportional to the excess water over that required to fill the pores—the larger the amount of excess water the greater the shrinkage.
3. Volume shrinkage of clays is proportional to

fineness of grain—the finer the grain the greater the shrinkage.

4. The greater the volume of shrinkage of clays the greater the tensile strength.

5. Increased clay content is accompanied by increased moisture retention and increased volume change.

6. Capillary action is greater in fine soils than in soils of coarse grain.

7. Capillary action is least in a vertical direction upward and is augmented by gravity.

TESTS REQUIRED

Application—Beginning with the year 1927, the construction manuals of the Construction Department have required that on all grading and paving jobs, field and laboratory examinations should be made of material entering into subgrade construction and should be examined for:

- (1) Lineal shrinkage.
- (2) Moisture equivalent.
- (3) Bearing power, when indicated as desirable.
- (4) Alkali content.

Lineal shrinkage is required not to exceed 5 per cent for soils or for binder in surfacing and not to exceed 3 per cent for filler in oil mixes.

Moisture equivalent in excess of 20 per cent is considered undesirable.

A bearing power of less than 30 pounds per square foot is considered unsatisfactory.

An alkali content of more than two and one-half in 1000 is undesirable.

"WATCH THE OTHER FELLOW" IS GOOD DRIVING RULE

One of the sound rules for safe driving is to "watch the other fellow." When we form the habit of doing just that we keep our eyes on the road ahead. When we keep our eyes on the road ahead it's ever so much easier to keep our minds on the all-important job of driving safely.

Watching the other fellow develops a new interest in him, too. It fosters a badly needed highway courtesy. It is a constant reminder that the road is owned by all, and not by any one driver. It tells us that the other fellow has equal rights with our own.

When we consider driving a privilege, rather than a right, we will all get along better. And when we make it a practice of watching the other driver we will come to realize that driving is a mutual proposition, and that our highways will become safer only when we develop that spirit of fairness to all when we are at the wheel.—*National Safety Council.*

Program of Roadside Development Under Way in Southern California

By H. DANA BOWERS, Landscape Engineer

In addition to the planting of evergreen ground covers that remove fire hazards from roadsides and the protection of slopes from erosion by suitable plantings, the use of unemployed labor relief crews permits building drinking fountains, protective walls, stone gutters and other so-called beautification units as described by H. Dana Bowers in this final article on that subject.

SOME of the most noteworthy beautification projects accomplished in southern California have been the establishment of drinking fountains, lookout points, parking areas and protective rubble walls along the Crest Drive from San Bernardino to Big Bear Lake. This route has a peak 16-hour traffic of approximately 5000 cars, for the most part pleasure bent. It is justly named the Crest or Rim of the World Drive as it affords vast panoramas of scenic splendor, including desert, mountain, and valley scenes.

Due to the altitude many ascending cars stop to cool their motors and to replenish their water supply. For this purpose springs have been developed at every available source and the water carried to fountains where it is accessible to the traveler. These fountains are usually located on some scenic point protected by colorful naturalistic rubble walls.

WORK FOR UNEMPLOYED

The water is also available for fire fighting purposes and connections have been installed at the fountains to permit filling of tank equipment.

All this work, including the laying of rock gutters to limit erosion, has been done with unemployed relief labor.

A parking area and drinking fountain was constructed across from the Sand Hill maintenance yard near Yuma, with Athol trees surrounding it to afford a small, relatively cool area for public use. The appreciation of this effort to provide public comfort is readily seen in the number of cars stopping there daily.

The following grade separations have been planted to vines and trees in order to stop erosion on unpaved slopes and to frame the

structures to present a more worthwhile appearance:

Route 9 on Foothill Boulevard, Glendora Subway, Malaga Subway and Cucamonga Subway.

Route 2 on Camino Real, Irvine Overhead, Galavan Overhead, two subways at Serra and the Oceanside Subway.

SLOPES PLANTED

The Rubidoux bridge at Riverside was framed with ivy and native shrubs to harmonize with the work the city has been doing on the highways adjacent to the bridge.

The Gish Subway on Route 31 on the Cajon Pass will be planted to various varieties of cactus. The arid conditions there prohibit the use of any but self-sustaining plants and the effect from such a planting should be very interesting.

The use of unemployed relief workers and funds has made it possible to accomplish many useful beautification projects not likely to be done by public subscription or civic bodies.

Civic work has usually been confined to tree planting and occasional small parks within the right of way. Our policy at present provides for the maintenance of trees upon receipt of the initial cost and the first year maintenance by the permittee. The maintenance of parks is deemed too expensive and generally the permittee is required to assume all future maintenance.

A program of clearing the undesirable brush and debris and removing dead and dangerous trees is carried out each season not only to reduce the fire hazard and eliminate danger to motorists, but also to improve the highways from a material and aesthetic point of view. A very material benefit is the destruction of breeding spots for insect pests.



PROTECTION AND PREVENTION are exemplified in the above scene. Contingents of unemployment relief workers are building rock gutters to catch drainage waters from the mountain slope, thus protecting the road.



HERE'S THE REASON for slope plantings. Eroded banks like the one in this picture not only are unsightly but the maintenance cost of removing sloughed material from the road runs up high every season.



BEAUTY AND UTILITY are combined in this cascade and fountain pool constructed on the Crest Road in San Bernardino County. Springs are diverted to the fountain, affording a water supply for motorists and fire fighters.

Water Applications and Permits

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of September, 1932.

MONO COUNTY—Application 7359. Gilbert C. Wedertz, Bridgeport, Cal., for 0.0025 c.f.s. from an unnamed spring, tributary to upper Twin Lake, to be diverted in Sec. 6, T. 3 N., R. 24 E., M. D. B. and M. For domestic purposes. Estimated cost \$300.

TEHAMA COUNTY—Application 7360. Crusade Prospectors, c/o M. E. Heiser, 2504 Cabrillo Street, San Francisco, Cal., for 100 c.f.s. from (1) Deer Creek, (2) Smoky Creek Tributary to (1) Sacramento River, (2) Deer Creek, to be diverted in (1) Sec. 27, T. 27 N., R. 3 E., M. D. B. and M., (2) Sec. 15, T. 26 N., R. 3 E., M. D. B. and M. For mining and domestic purposes.

HUMBOLDT COUNTY—Application 7361. Charles Doss, Orleans, Cal., for 3 c.f.s. from Red Cap Gulch, tributary to Klamath River, to be diverted in Sec. 9, T. 10 N., R. 5 E., H. B. and M. For mining purposes. Estimated cost \$1,000.

TRINITY COUNTY—Application 7362. Charles J. Worden, Box 232, Weaverville, Cal., for 50 c.f.s. from Canyon Creek, tributary to Trinity River, to be diverted in Sec. 1, T. 34 N., R. 11 W., M. D. B. and M. For mining purposes.

SAN LUIS OBISPO COUNTY—Application 7363. City of San Luis Obispo, c/o J. B. Lippincott, 714 West Tenth Street, Los Angeles, Cal., for 3000 acre-feet per annum from Salinas River, tributary to Monterey Bay, to be diverted in Sec. 36, T. 29 S., R. 13 E., M. D. B. and M. For municipal purposes.

EL DORADO COUNTY—Application 7364. C. M. Carter, R. D. Nicol and W. P. Austin, c/o C. M. Carter, 1733 Jefferson Street, Oakland, Cal., for 100,000 acre-feet per annum from South Fork American River, tributary to American River, to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For municipal purposes. Estimated cost \$9,000,000.

EL DORADO COUNTY—Application 7365. C. M. Carter, R. D. Nicol and W. P. Austin, c/o C. M. Carter, 1733 Jefferson Street, Oakland, Cal., for 614,000 acre-feet per annum from South Fork of American River, tributary to American River, to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For irrigation purposes (450,000 acres). Estimated cost \$9,000,000.

SAN DIEGO COUNTY—Application 7366. Julius Wieden, c/o H. Delemere Thurber, Fallbrook, Cal., for 1 c.f.s. from an unnamed creek, tributary to Santa Margarita River watershed, to be diverted in Sec. 1, T. 9 S., R. 5 W., S. B. B. and M. For irrigation and domestic purposes (10 acres). Estimated cost \$1,000.

EL DORADO COUNTY—Application 7367. B. W. Stone, 24 California Street, San Francisco, Cal., for 500 c.f.s., 125,000 acre-feet per annum from Rubicon River, Pilot Creek, Gerle Creek, Loon Lake, Buck Island Lake, Rock Bound Lake and Little South Fork of Rubicon River, tributary to American River drainage area, to be diverted in Sec. 9, T. 13 N., R. 16 E., Sec. 11, T. 12 N., R. 12 E., Sec. 24, T. 13 N., R. 13 E., Secs. 11, 31 and 34, T. 14 N., R. 14 E., Sec. 4, T. 13 N., R. 15 E., Sec. 2, T. 13 N., R. 14 E., all M. D. B. and M. For municipal purposes.

PLACER COUNTY—Application 7368. F. M. Chrisman, 1023 Russ Building, San Francisco, Cal., for 250 c.f.s., 200,000 acre-feet per annum from Middle Fork of American River, tributary to Sacramento River, to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For power purposes (250 h.p.). Estimated cost \$18,000,000.

PLACER COUNTY—Application 7369. F. M. Chrisman, 1023 Russ Building, San Francisco, Cal., for 250 c.f.s., 200,000 acre-feet per annum, from Middle Fork of American River, tributary to Sacramento River, to be diverted in Sec. 36, T. 15 N., R. 13 E., M. D. B. and M. For municipal purposes. Estimated cost \$15,000,000.

PLUMAS COUNTY—Application 7370. State of California, Dept. of Public Works, Division of Highways, Public Works Bldg., Sacramento, Cal., for 0.025 c.f.s. from unnamed hillside spring, tributary to Spanish Creek, thence East Branch North Fork Feather River, to be diverted in Sec. 10, T. 25 N., R. 9 E., M.

D. B. and M. For industrial and recreational purposes. Estimated cost \$100.

TEHAMA COUNTY—Application 7371. State of California, Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, Cal., for 0.025 c.f.s. from an unnamed spring, tributary to Battle Creek, to be diverted in Sec. 24, T. 29 N., R. 3 E., M. D. B. and M. For domestic and fire protection. Estimated cost \$1,100.

PLACER COUNTY—Application 7372. H. G. Stibbs, 234 Holbrook Bldg., San Francisco, Cal., for 250 c.f.s. from (1) Secret Canyon, (2) Little Secret Canyon, (3) El Dorado Canyon, (4) West Branch El Dorado Canyon, tributary to Middle Fork American River, to be diverted in (1) Sec. 1, T. 15 N., R. 12 E., (2) Sec. 1, T. 15 N., R. 12 E., (3) Sec. 19, T. 15 N., R. 12 E., (4) Sec. 35, T. 15 N., R. 11 E., all M. D. B. and M. For mining purposes. Estimated cost \$5,000.

HUMBOLDT COUNTY—Application 7373. Thomas K. Walker, Weitchpec, Cal., for 0.5 c.f.s. from Diamond Creek and Taylor Springs, tributary to Klamath River, to be diverted in Sec. 17, T. 10 N., R. 5 E., H. B. and M. For irrigation purposes.

HUMBOLDT COUNTY—Application 7374. Mrs. Anna Fries Walker, c/o Thomas K. Walker, Weitchpec, Cal., for 0.5 c.f.s. from Diamond Creek and Taylor Springs, tributary to Klamath River, to be diverted in Sec. 17, T. 10 N., R. 5 E., H. B. and M. For mining purposes.

SANTA CRUZ COUNTY—Application 7375. Ethel A. Simms, Route 4, Box 164, Santa Cruz, Cal., for 0.33 c.f.s. from a well, tributary to San Lorenzo River, to be diverted in Sec. 36, T. 10 S., R. 2 W., M. D. B. and M. For irrigation and domestic purposes (6 acres). Estimated cost, \$565.

SISKIYOU COUNTY—Application 7376. Murty Brickley, c/o James D. Fairchild, Attorney, Yreka, Cal., for 2.5 c.f.s. from Walker Creek, tributary to Klamath River, to be diverted in Sec. 18, T. 46 N., R. 11 W., M. D. B. and M. For irrigation and domestic purposes (80 acres). Estimated cost, \$25.

SISKIYOU COUNTY—Application 7377. M. J. Brickley, c/o James D. Fairchild, Attorney, Yreka, Cal., for 2.5 c.f.s. from Walker Creek, tributary to Klamath River, to be diverted in Sec. 18, T. 46 N., R. 11 W., M. D. B. and M. For irrigation and domestic purposes (50 acres). Estimated cost, \$100.

SAN BERNARDINO COUNTY—Application 7378. Gustav Gocke, Lillian V. Gocke, Julius Thorp, and E. B. Thorp, c/o Gustav Gocke, 301 Hermosa Avenue, for 0.25 c.f.s. from an unnamed spring, tributary to Arroyo Creek, to be diverted in Sec. 34, T. 2 N., R. 2 E., M. D. B. and M. For domestic purposes. Estimated cost, \$800.

SIERRA COUNTY—Application 7379. S. H. Snow, Sierra City, Cal., for (1) 6.00 c.f.s., (2) 4.00 c.f.s. from (1) Butcher Ranch Creek, (2) Branch of Butcher Ranch Creek, tributary to East Branch of North Fork of North Fork of Yuba River, to be diverted in (1) Sec. 1, T. 20 N., R. 11 E., M. D. B. and M., (2) Sec. 6, T. 20 N., R. 12 E., M. D. B. and M. For mining purposes. Estimated cost, \$1,000.

CALAVERAS COUNTY—Application 7380. Calaveras Water Users Association, Inc., c/o Virgil M. Airola, Attorney, San Andreas, Cal., for (A) 4.7 c.f.s., (B) 7.0 c.f.s., (C) 3.3 c.f.s., (D) 5.0 c.f.s., from natural flow of Angels Creek and natural and regulated flow of North Fork Stanislaus River as discharged into Angels Creek resulting from the diversion of the natural flow of said Stanislaus River as augmented and equalized by storage reservoirs thereon known as Union Reservoir, Silver Valley Reservoir and Utica Reservoir, tributary to Stanislaus River, to be diverted in (A) Sec. 33, T. 4 N., R. 14 E., M. D. B. and M., (B) Sec. 4, T. 3 N., R. 14 E., (C) Sec. 7, T. 3 N., R. 14 E., (D) Sec. 12, T. 3 N., R. 13 E., all M. D. B. and M. For irrigation and domestic purposes (14,610 acres). Estimated cost, \$50,000.

SAN DIEGO COUNTY—Application 7381. Dana Burks, c/o Thomas H. King, 608 Electric Bldg., San Diego, Cal., for 25 c.f.s. and 100,000 acre-feet per annum from Coyote Creek, tributary to San Felipe Creek, thence Salton Sea, to be diverted in (point of direct diversion and point of recovery of stored water)

Appropriations Granted to Users

(Continued from preceding page)

Sec. 26, T. 9 S., R. 5 E., Secs. (points of diversion to underground storage) 4, 5, 8 and 9, T. 9 S., R. 5 E., all S. B. B. and M. For irrigation and domestic purposes (18,000 acres).

SIERRA COUNTY—Application 7382. J. F. Siegfried, Downieville, Cal., for 7.5 c.f.s. from Jim Crow Creek, tributary to South Fork of North Fork of Yuba River, to be diverted in Sec. 6, T. 19 N., R. 11 E., M. D. B. and M. For mining purposes. Estimated cost, \$1,500.

SIERRA COUNTY—Application 7383. Clifford A. Thompson, c/o R. F. Taylor, Downieville, Cal., for 3.0 c.f.s. from Howard Creek, tributary to North Fork of North Fork of Yuba River, thence North Fork Yuba River, Feather River and Sacramento River, to be diverted in Sec. 26, T. 21 N., R. 12 E., M. D. B. and M. For mining purposes. Estimated cost, \$500.

SAN BENITO COUNTY—Application 7384. O. F. Haller, Hollister, Cal., for 1000 acre-feet per annum, from Dos Picachos Creek, tributary to Pajaro River, to be diverted in Sec. 16, T. 12 S., R. 6 E., M. D. B. and M. For irrigation purposes (1000 acres). Estimated cost, \$1,000.

EL DORADO COUNTY—Application 7385. E. D. N. Lehe, Al Tahoe, Cal., for (1) 500 acre-feet per annum, (2) 5 c.f.s., from (1) Star Lake and (2) Cold Creek, tributary to (1) Cold Creek, (2) Lake Tahoe, to be diverted in (1) Sec. 30, T. 12 N., R. 19 E., M. D. B. and M., (2) Sec. 11, T. 12 N., R. 18 E., M. D. B. and M. For municipal and domestic purposes.

EL DORADO COUNTY—Application 7386. N. L. Apollonia, 1708½ O Street, Sacramento, Cal., for 0.025 c.f.s. from waste and seepage waters in unnamed ravine, tributary to Brush Creek, thence South Fork American River, to be diverted in Sec. 4, T. 10 N., R. 12 E., M. D. B. and M. For domestic purposes. Estimated cost, \$400.

EL DORADO COUNTY—Application 7387. E. H. Richmond, 225 Cedar Street, Roseville, Cal., for 600 gallons per day from an unnamed spring, tributary to South Fork American River, to be diverted in Sec. 26, T. 11 N., R. 15 E., M. D. B. and M. For domestic purposes. Estimated cost, \$50.

LOS ANGELES COUNTY—Application 7388. United States, Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, Cal., for 0.002 c.f.s. from Squaw Creek, tributary to Little Rock Creek, to be diverted in Sec. 13, T. 3 N., R. 11 W., S. B. B. and M. For domestic purposes. Estimated cost, \$8.

LOS ANGELES COUNTY—Application 7389. United States, Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, Cal., for 0.005 c.f.s. from San Olene Creek, tributary to Big Santa Anita Creek, thence San Gabriel River, to be diverted in Sec. 3, T. 1 N., R. 11 W., S. B. B. and M. For domestic purposes. Estimated cost, \$175.

LOS ANGELES COUNTY—Application 7390. United States, Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, Cal., for 0.005 c.f.s. from Rush Creek, tributary to West Fork of San Gabriel River, to be diverted in Sec. 20, T. 2 N., R. 11 W., S. B. B. and M. For recreation and domestic purposes. Estimated cost, \$10.

TRINITY COUNTY—Application 7391. Anna Safford Gamble, 1700 Ellis Street, San Francisco, Cal., for 0.05 c.f.s. from unnamed spring, tributary to Trinity River, to be diverted in Sec. 7, T. 37 N., R. 7 W., M. D. B. and M. For irrigation and domestic purposes (2 acres). Estimated cost, \$225.

BUTE COUNTY—Application 7392. Ray L. Wakeman, Box 197-A, Route 1, Oroville, Cal., for 0.33 c.f.s. from Cottonwood Creek, tributary to Dry Creek, to be diverted in Sec. 33, T. 20 N., R. 3 E., M. D. B. and M. For irrigation and domestic purposes on 20 acres. Estimated cost, \$150.

RIVERSIDE COUNTY—Application 7393. Lloyd Wright, 1125-1130 Board of Trade Bldg., Los Angeles, Cal., for 0.02 c.f.s. and 2.64 acre-feet per annum from Bear Trap Canyon, tributary to Strawberry Creek, to be diverted in Sec. 12, T. 5 S., R. 2 E., S. B. B. and M. For recreational purposes. Estimated cost, \$6,500.

PLACER COUNTY—Application 7394. J. E. Starratt, Box 185, Roseville, Cal., for 10 c.f.s. from Shirt Tail Creek, tributary to North Fork American River,

to be diverted in Sec. 25, T. 15 N., R. 10 E., M. D. B. and M. For power and domestic purposes (170.5 h.p.). Estimated cost, \$2,000.

PLUMAS COUNTY—Application 7395. Joseph Perlich, 2190 Meyers Street, Oroville, Cal., for 1.5 c.f.s. from Bellbar Creek, tributary to Middle Fork Feather River, to be diverted in Sec. 17, T. 23 N., R. 11 E., M. D. B. and M. For mining and domestic purposes. Estimated cost, \$50.

SISKIYOU COUNTY—Application 7396. Helen Russell Prince, 726 Sutter Street, San Francisco, Cal., for 0.5 c.f.s. from North Fork of Russian Creek, tributary to North Fork Salmon River, thence Salmon River and Klamath River, to be diverted in Sec. 19, T. 40 N., R. 10 W., M. D. B. and M. For irrigation and domestic purposes (11.5 acres).

Permits to appropriate water, issued by the Department of Public Works, Division of Water Resources, during the month of September, 1932.

TRINITY COUNTY—Permit 3968, Application 6827. Humboldt Placer Mining Co., Blocksburg, Cal., September 1, 1932, for 175 c.f.s. from Stuarts Fork Trinity River, Owens Creek, Van Matre Creek and Slate Creek, tributaries of Trinity River in Sec. 3, T. 36 N., R. 9 W., M. D. B. and M., Secs. 12 and 24, T. 35 N., R. 10 W., M. D. B. and M., and Sec. 4, T. 34 N., R. 9 W., M. D. B. and M. For mining and domestic purposes.

TRINITY COUNTY—Permit 3969, Application 6985. Majestic Mines Co., Boston, Mass., September 1, 1932, for 100 c.f.s. from Rush Creek, tributary to Trinity River in Sec. 5, T. 34 N., R. 9 W., M. D. B. and M. For mining and domestic purposes. Estimated cost, \$50,000.

LOS ANGELES COUNTY—Permit 3970, Application 7148. Division of Highways, Dept. of Public Works, State of California, Box 1103, Sacramento, Cal., September 6, 1932, for 2000 gals. per day from Templeton Spring, tributary to Piru Creek in Sec. 12, T. 6 N., R. 13 W., S. B. B. and M. For industrial and domestic purposes, highway construction and maintenance, support of shade trees and use of traveling public. Estimated cost, \$1,000.

LOS ANGELES COUNTY—Permit 3971, Application 7214. U. S. Angeles National Forest, 501 Brownstein Bldg., Los Angeles, Cal., September 6, 1932, for 0.003 c.f.s. from unnamed spring, tributary of Piru Creek watershed in Sec. 12, T. 6 N., R. 18 W., S. B. B. and M. For fire fighting purposes. Estimated cost, \$500.

SIERRA COUNTY—Permit 3972, Application 7129. H. L. Berkey, 728 E. 4th St., Tucson, Ariz., September 7, 1932, for 60 c.f.s. from Canyon Creek, tributary to Yuba River in Sec. 18, T. 21 N., R. 10 E., M. D. B. and M. For mining purposes. Estimated cost, \$30,000.

ALPINE COUNTY—Permit 3973, Application 7294. J. E. Taylor, Oakley, Cal. and L. H. Honey, 625 N. Regent St., Stockton, Cal., September 7, 1932, for 400 gals. per day from a spring, tributary to Twin Lakes and South Fork American River in Sec. 18, T. 10 N., R. 18 E., M. D. B. and M. For domestic purposes. Estimated cost, \$400.

SISKIYOU COUNTY—Permit 3974, Application 7300. William Wike, Sawyers Bar, Cal., September 8, 1932, for 2.50 c.f.s. from East Fork Eddy's Gulch, tributary to Eddy's Gulch, thence North Fork Salmon River in Section 15, T. 39 N., R. 11 W., M. D. B. and M. For mining and domestic purposes.

MONO COUNTY—Permit 3975, Application 7265. Helen Patterson, Bishop, Cal., September 10, 1932, for 200 gals. per day from Rock Creek, tributary to Owens River in Sec. 33, T. 4 S., R. 30 E., M. D. B. and M. For domestic purposes. Estimated cost, \$25.

DEL NORTE COUNTY—Permit 3976, Application 7242. U. S. Siskiyou National Forest of Grants Pass, Oregon, September 12, 1932, for 0.017 c.f.s. from unnamed stream, tributary to Middle Fork Smith River in Sec. 32, T. 18 N., R. 4 E., H. B. and M. For domestic uses.

DEL NORTE COUNTY—Permit 3977, Application 7243. U. S. Siskiyou National Forest, Grants Pass, Oregon, September 12, 1932, for 0.017 c.f.s. from unnamed spring, tributary to Smith River in Sec. 29, T. 17 N., R. 2 E., H. B. and M. For domestic purposes. Estimated cost, \$850.

Fast Work Opened Highways Damaged By Tehachapi Flood

(Continued from page 4)

road structure, causing the water to flow over the tracks and highway. The highway bridge, a rather fragile structure, was damaged seriously enough to make replacement necessary.

The water finally flowed out into the vineyards and fields of the San Joaquin Valley near Arvin. The bodies of fifteen people have been recovered although the exact loss of life will probably never be known as a large number of transients were apparently aboard the freight cars.

QUICK REPAIR WORK

Highway maintenance forces started repair work on the damaged road during the storm. By Saturday evening, October 1st, through travel was made possible by way of a detour using the Arvin road and a partial width road at Woodford. At intervals the next day the traffic was permitted to pass, drilling and blasting at Woodford interfering somewhat. Permanent repair to the highway is progressing without further traffic interruption.

The damage to the State road was very much less than that to the railroad. The quick repair of the highway, together with the temporary detours, proved a great benefit to the railroad and telegraph companies as it made the center of the damaged area quickly accessible and allowed repair work to commence at many points rather than a progressive attack from the ends.

The cost to the State including repair of the damaged road and bridges, installation of additional small drainage structures and temporary detours for restoring traffic will amount to about \$45,000.

A reconstruction of the Bakersfield-Mojave Route is programmed and surveys and plans are partially complete. This route has been under State maintenance for about a year, being constructed by Kern County and taken into the State secondary system August, 1931.

Prize Alibi

"Don't you work in my motor plant?"
"Yes, boss."
"Didn't I tell you to make a garden?"
"There it is, boss. I'm raising goldenrod for tires."
—The Louisville Courier.

Dams Now Building Total 11, with 160 Undergoing Repairs

(Continued from page 31)

DAMS

To date 812 applications have been received for approval of dams built prior to August 14, 1929; 98 for approval of plans for construction or enlargement and 361 for approval of plans for repair or alteration.

a. Applications Received for Approval of Plans for Construction or Enlargement of Dams.

Dam	Owner	County
Canyon Creek	H. L. Berkey	Sierra
Gladhaven	Carrie A. Gladding	Placer

b. Applications Received for Approval of Plans for Repair or Alteration of Dams.

Dam	Owner	County
Dallas Warner	Modesto Irrigation District	Stanislaus
Grizzly Creek	Clover Valley Lumber Company	Plumas
Montague City Res.	Montague Water Conservation Dist.	Siskiyou
Lower Feeley	Pacific Gas & Electric Company	Nevada
Hart	E. C. and Kate Hart	Siskiyou

c. Plans Approved for Construction or Enlargement.

Dam	Owner	County
*McGowan	First National Bank, Santa Ana	Tehama
†Gladhaven	Carrie A. Gladding	Placer

d. Plans Approved for Repair or Alteration.

Dam	Owner	County
Dry Canyon	City of Los Angeles	Los Angeles
Lake Herman	Benicia Water Company	Solano
Dennis Martin	A. Schilling	San Mateo
Railroad Canyon	Temescal Water Company	Riverside
Kennedy	Kennedy Mining & Milling Co.	Amador
Dallas Warner	Modesto Irrigation District	Stanislaus
Grizzly Creek	Clover Valley Lumber Company	Plumas
Montague City Res.	Montague Water Conservation Dist.	Siskiyou
L. Sherwood	L. Sherwood Country Club	Ventura
Lower Feeley	Pacific Gas & Electric Co.	Nevada

* Enlargement
† New Construction

There are 11 dams under construction on which frequent inspections are being made to assure adherence to the approved plans and specifications.

Inspections are being regularly made on approximately 160 dams which are under repair. Upon completion of this repair work certificates of approval will be issued.

Routine inspections of the remainder of the dams are made in accordance with the provision of the Dam Act providing for supervision over maintenance and operation.

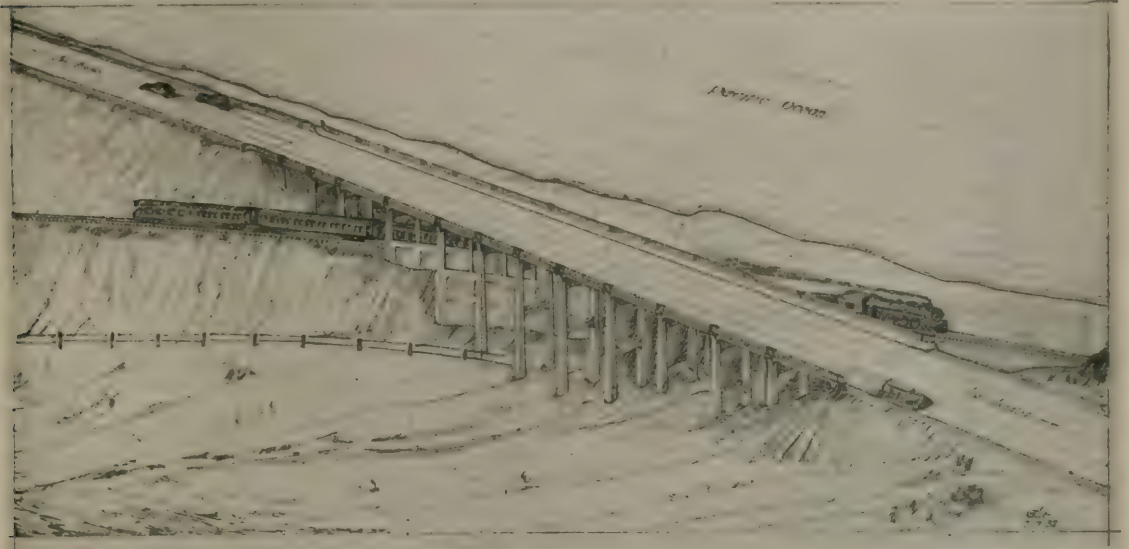
Sex a Difference

Man criticises woman for her extravagance, but she never wastes two dollars' worth of shot-gun shells in order to get a twenty-cent rabbit.—Louisville Times.

Nor uses twenty gallons of gasoline and pays \$25 boat hire to get where the fish aren't.—Houston Post-Dispatch.

Nor goes into a restaurant and buys a 25-cent meal and gives the waiter a 25-cent tip because he smiled at her.—Florida Times-Union.

Sorrento Overhead Involved Problems



ALL SKEWED are the two 58-foot girder spans over the railroad in the Sorrento Canyon grade separation structure. This arrangement is made necessary by the railroad route on a 3-degree curve intersecting the highway at an angle of 27 degrees, 30 minutes.

By **M. J. DWYER**, Assistant Bridge Designing Engineer

AN IMPORTANT improvement in alignment and grade will soon be realized by the motorists in the line change on the Coast Highway at Sorrento Canyon near Del Mar on Route 2, San Diego County, near the city limits of San Diego. Approximately 10 miles of winding roadway with several small radius curves and steep grades will be replaced by 9.4 miles of comparatively straight alignment and uniformly low grades.

At this location the highway crosses under the Atchison, Topeka & Santa Fe Railway through a subway which has inadequate approach grades and alignment. After a thorough consideration of the relocation it was found more feasible and economical to make an overhead crossing with an entirely new line. The present subway, however, will not be abandoned as it will serve the local travel in Sorrento Canyon and separate it from the through highway.

PROVISIONS FOR WIDENING

The new grade separation will be several thousand feet north of the present subway

and will consist of a reinforced concrete structure 550 feet long with a 42-foot width roadway and a 4-foot sidewalk.

The railway alignment at the point of intersection with the highway is located on a 3 degree curve. The angle of intersection of the highway with the railway is 27 degrees 30 minutes. This small angle of intersection lead to some difficult problems.

SKEWED SPANS

The structure directly over the railway tracks consists of two 58-foot skewed girder spans resting on six column bents. The remainder of the structure consists of 40-foot reinforced concrete girder spans resting on four column bents normal to the roadway.

The foundation material is of variable character and after considerable investigation it was found necessary to support the bents at the south end of the structure on concrete piles, but bents at the north end were supported on spread footings. The comparatively high bents is a structural feature that required careful study, making it necessary to design columns with a slight batter to obtain proper appearance.

Plans Approved in September for Dam Alterations, Repairs

APPLICATIONS FILED

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of September, 1932.

LASSEN COUNTY—Boot Lake Dam No. 1226. Victor Christensen and F. R. Humphrey, Likely, owner; earth, 3 feet above streambed with a storage capacity of 700 acre-feet, situated on Boot Lake Creek, tributary to Red Rock Creek in Sec. 15, T. 37 N., R. 16 E., M. D. B. and M.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of September, 1932.

NEVADA COUNTY—Lower Feeley Lake Dam, No. 97-35. Pacific Gas and Electric Company, San Francisco, owner; earth and rock, situated on Fall Creek, tributary to South Yuba River in Sec. 29, T. 18 N., R. 12 E., M. D. B. and M.

SISKIYOU COUNTY—Hart Dam, No. 181. E. C. and Kate C. Hart, Montague, owner; earth, situated on Martin Creek, tributary to Little Shasta River in Sec. 19, T. 45 N., R. 4 W., M. D. B. and M.

KERN COUNTY—Diversion No. 1 Dam No. 104-2. Southern California Edison Company, Los Angeles, owner; gravity, situated on Kern River in Sec. 5, T. 28 S., R. 31 E., M. D. B. and M.

PLUMAS COUNTY—Grizzly Creek Dam No. 285. Clover Valley Lumber Company, Loyalton, owner; slab and buttress, situated on Grizzly Creek, tributary to Middle Fork Feather River in Sec. 20, T. 23 N., R. 14 E., M. D. B. and M.

SIERRA COUNTY—Fairplay Lower Dam No. 296-4. J. I. McCullough, El Paso, Texas, owner; earth, located in T. 20 N., R. 9 E., M. D. B. and M.

SAN BENITO COUNTY—Paicines Dam No. 652. San Benito Land and Water Company, Hollister, owner; earth, situated on tributary to Pajaro River.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of September, 1932.

PLACER COUNTY—Gladhaven Dam No. 327. Carrie A. Gladding, Lincoln, owner; buttress, 19 feet above streambed with a storage capacity of 200 acre-feet, situated on Coon Creek, tributary to Feather River in Sec. 21, T. 13 N., R. 6 E., M. D. B. and M. For storage purposes, for irrigation and domestic use.

SIERRA COUNTY—Canyon Creek Dam No. 293. H. L. Berkeley, Tucson, Ariz., owner; rock crib, 15 feet above streambed with a storage capacity of 8 acre-feet, situated on Canyon Creek, tributary to North Fork Yuba River in Section 18, T. 21 N., R. 10 E., M. D. B. and M. For diversion purposes, for mining use.

MODOC COUNTY—J. L. Porter Dam No. 162. Pearl F. Porter, Alturas, owner; earth and rock, 22 feet above streambed with a storage capacity of 250 acre-feet, situated on tributary of Parker Creek in Sec. 12, T. 42 N., R. 13 E., M. D. B. and M. For storage purposes, for irrigation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of September, 1932.

PLUMAS COUNTY—Grizzly Creek Dam No. 285. Clover Valley Lumber Company, Loyalton, owner; slab and buttress, situated on Grizzly Creek, tributary to Middle Fork Feather River in Sec. 20, T. 23 N., R. 14 E., M. D. B. and M.

SISKIYOU COUNTY—Montague City Reservoir No. 60-2. Montague Water Conservation District, Montague, owner; earth, located in Sec. 23, T. 45 N., R. 6 W., M. D. B. and M.

VENTURA COUNTY—Lake Sherwood Dam No. 765. Lake Sherwood Country Club, Los Angeles, owner; gravity, situated on Triunfo Creek, tributary to Malibu Creek, in Sec. 27, T. 1 N., R. 19 W., S. B. B. and M.

In Memoriam

Former associates were shocked during the past month to learn of the death of James M. Brockway, formerly with the Division of Water Resources from 1927 to 1931 as an Assistant Hydraulic Engineer. He was drowned on September 14th while at work on the Rio Grande River. Details of the accident are lacking, but it is reported that an outboard motorboat that he was piloting under flood conditions hit a snag and capsized.

Brockway left the employ of the Division in August, 1931, to accept a position with the International Water Commission at El Paso, Texas, and at the time of his death held a responsible position with headquarters at San Benito, Texas. He was a graduate of the University of California with the class of 1927 and had a varied experience in the hydraulic engineering field. While with the Division of Water Resources he was engaged on the work of the Sacramento-San Joaquin Water Supervisor.

"Jim's" conscientious work, winning smile and likeable personality had won for him a host of friends who feel most keenly his loss practically at the threshold of his career. It was only a few months ago that the announcements were received of Jim's marriage.

NEW MENTAL HOSPITAL MASTER PLAN ADOPTED FOR 6000 PATIENT CAPACITY

(Continued from page 15)

and concrete roof with clay tile covering and will therefore be fire and deterioration resisting throughout.

The amount of money at present available is \$1,000,000. About \$700,000 of this amount will be used for buildings, the remainder being required for roads and walks, sewage disposal, sewage collection, water development and distribution, gas, electric and telephone services, flood control, fire protection, ground lighting, interior furnishings and for equipment for dairy, laundry, bakery, kitchen and landscaping.

The total sum of \$7,000,000 will probably be required to complete the entire 6000-patient institution and the length of time involved in ultimate completion will of course depend on the demand for additional beds and the provision of funds.

The site being only five miles from the coast in a straight line, the climate is cool in summer and mild in winter which will make the new institution unique as having a somewhat more equable climate than any of the other six existing State mental hospitals.

PICTURESQUE SETTING

The natural contours of the building site itself and the relation to it of the surrounding hills are such as to provide a most picturesque setting for the buildings which as already stated will be located on rising ground and will be approached from the entrance lying on somewhat lower ground. These hills besides adding to the picturesqueness of the building group will provide effective protection against such winds and fogs as usually occur along the coast.

STATE OF CALIFORNIA

Department of Public Works

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FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample



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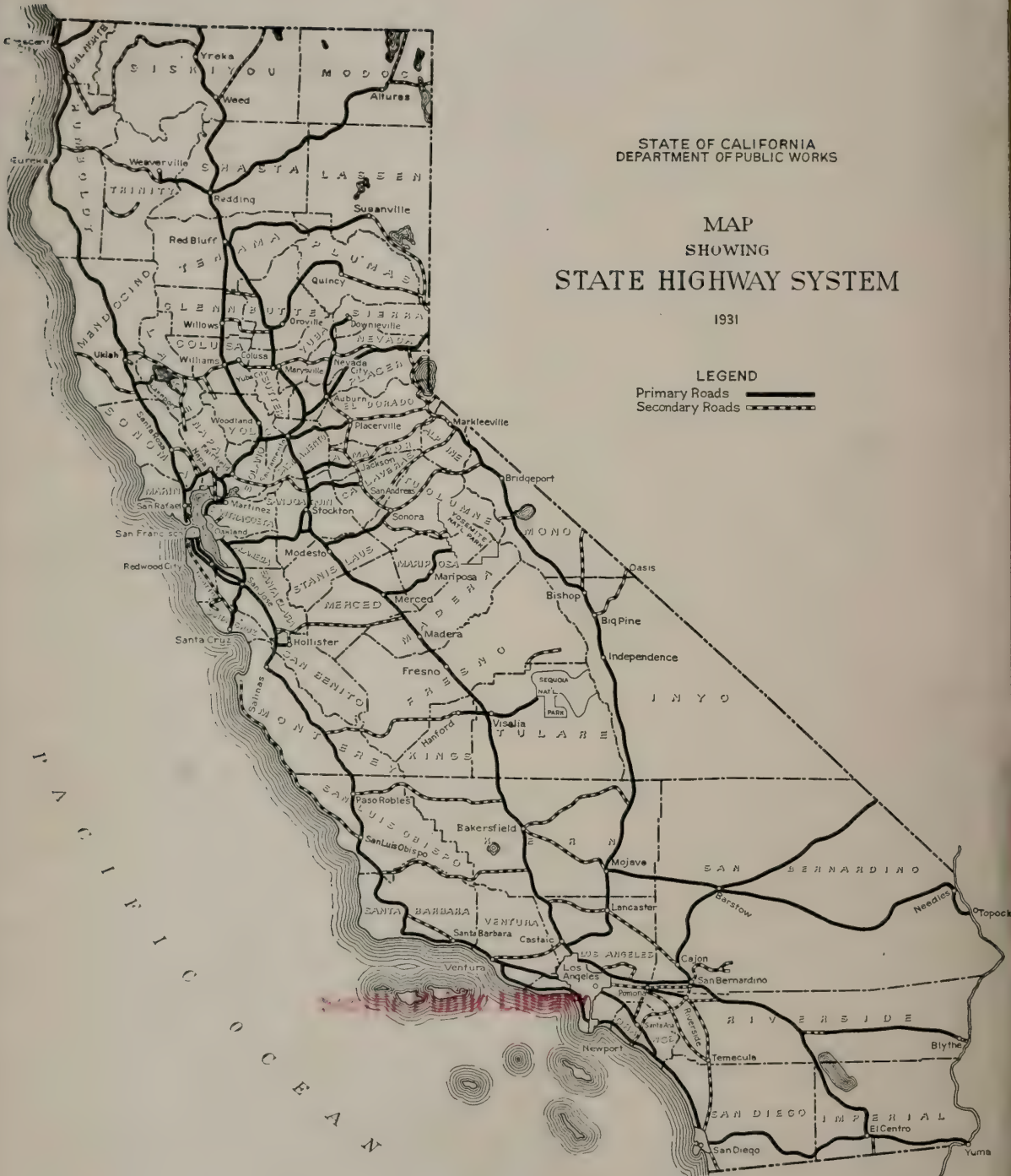
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

1931

LEGEND

Primary Roads 
Secondary Roads 



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PUBLIC WORKS**
December 1932



OFFICIAL JOURNAL of the DEPARTMENT
of PUBLIC WORKS of CALIFORNIA

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464 Miles of Road Construction, 41 Bridges, Built by State in 1932

Review of Year's Work by Division of Highways Reveals
Quick Turnover of Funds for Extensive Improve-
ments and Unemployment Relief

WITH the year 1932 passing into the yesterdays, another record of accomplishment has been set by the California Division of Highways. In the midst of troublous times the millions of dollars paid by the motorists of the State have been quickly returned for labor and materials used in the construction and reconstruction of hundreds of miles of State highways and in maintenance work covering the entire State road system.

At the instance of Governor Rolph and under direction of Earl Lee Kelly employment is being given to hand labor in maintenance work as far as is compatible with reasonable economy.

Figures compiled in the office of C. H. Purcell, State Highway Engineer and Chief of the Division of Highways, show the total of \$26,722,200 allotted for expenditures on State highway improvement in California during 1932. The accompanying tabulation compiled as of December 6th sets forth the general items whose aggregate make up this sum:

Construction and Reconstruction---	\$18,484,900
Maintenance-----	5,449,500
Allotted for Unemployment Relief--	1,650,000
Projects advertised for which bids will be opened prior to December 31st -----	1,187,800
Total -----	\$26,722,200

DETAIL OF TOTALS

The construction program for the Division which was inaugurated during the year just past is represented by the \$18,484,900 for construction and reconstruction commenced and the \$1,187,800 on advertised projects, the bids for which will be opened before the close of the year, making a total of \$19,672,700.

This amount covers construction work on 464 miles of State highway, oiling on 1350 miles of roads and the construction of 41 bridges. The following tabulation shows the mileage of the various types covered by the year's work:

Type	Miles	Amount
Permanent pavement-----	225	\$8,063,500
Bituminous-treated crushed rock surfacing-----	171	2,817,200
Untreated crushed rock sur- facing -----	10	176,800
Graded roadbed-----	58	2,481,900
Oiling as dust palliative----	1,350	539,800
Bridges -----	(41)	2,605,200
Minor improvements, etc.---	--	2,988,300
Total -----		\$19,672,700

The mileage figures are actual road miles regardless of the width of pavement or surfacing, and never before in the history of State highway construction in California has as much multiple lane pavement been placed. In the metropolitan areas around both Los Angeles and San Francisco the State has contracted for many miles of both 30-foot and 40-foot Portland cement or asphalt concrete paving.

WIDESPREAD RELIEF

The maintenance work during the year was considerably increased by the necessity of bringing to State highway standards as great a mileage as possible of the seven hundred miles of secondary highways added to the State system by the last Legislature. Many miles of these new roads were greatly improved by shoulder oiling and widening.

The \$1,650,000 allocated by the California Highway Commission for unemployment relief during the present winter is bringing aid to thousands of families throughout the State. Of this amount \$1,230,000 is being used for the expansion of maintenance crews in all of the Division's ten districts. The last reports show that 2613 men had been added to the maintenance forces and were working three days a week at \$4 per day.

In the Arroyo Seco Highway construction camp in Los Angeles County, 244 laborers were at work building construction roads and clearing brush and trees for further construction; \$120,000 was allotted for this camp.

Arroyo Seco Emergency Relief Camp Operating Full Quota of Workers

1 1 1 1 1 1

THE relief of unemployment has received the serious consideration of the Department of Public Works for the past two years. During this winter it is planned to furnish employment to as many men as possible with the funds available.

During the winter of 1930-31 only men having families or other dependents were employed on State Highway emergency relief work. When plans were being formulated for relief work for the winter of 1931-32, it was recognized that large numbers of transients without dependents were migrating to California in the hope of finding work and spending the winter in a mild climate.

It was even more difficult for these men to find employment than for married men for the reason that most employers give preference to men with families or other dependents. These itinerants drifted to the larger cities and their number added to the already large unemployed population.

MET SITUATION

To meet this situation several camps were established under the Division of Highways near the State border where these men could work for their board and lodging away from the congested cities. Places in these camps were eagerly sought by the men and a large amount of useful work was accomplished.

Early this fall it was decided to conduct a camp similar to the ones operated last winter but within easy access from Los Angeles. The State already owned an ideal camp fully equipped in the mountains twelve miles north of Pasadena.

It was established two years ago as an unemployment relief camp where men having families were employed during the winter of 1930-31. From April, 1931, until October, 1932, the camp was occupied by forces of a contractor engaged in grading the third unit of the new Arroyo Seco highway. As this contract was practically completed by October, 1932, the camp and equipment then became available for the relief forces.

The camp is located on what is known as "Firebreak Ridge" high in the mountains in the Angeles National Forest overlooking

Pasadena and adjacent to the new Arroyo Seco highway. Some idea can be gathered of the ruggedness of these mountains by the fact that the camp location is on the crest of a narrow ridge and is the only place in that vicinity having enough reasonable flat ground to accommodate a camp of this size.

Frame buildings of a more or less permanent character had been constructed two years ago consisting of bunkhouses, mess hall, recreation hall, office, etc. The camp had been fully equipped with kitchen utensils and bedding for a capacity of 250 men.

The first consideration in deciding on the location for the camp was that it should provide convenient access to work which either had to be or could be done by hand methods without the use of machinery and with a reasonable degree of economy. This Arroyo Seco camp is in an ideal location for such work.

CLEARED GRADE

Two years ago the men cleared the area for the new highway of brush and trees for the grading contract which was about to be let. Narrow pioneer roads and trails which were necessary to provide access to the grading work to be done ahead were constructed. There was also a small amount of grading done on the highway section.

Conditions this year are similar in the matter of work to be done to those existing two years ago except that an additional five miles of highway has since been graded so that the new Arroyo Seco highway has been completed as far as Colby Canyon. The next four-mile section from Colby Canyon to Mt. Wilson Road at Red Box will be undertaken when funds are available.

The new right of way is covered by a dense growth of brush and some trees. The clearing of this area is necessarily a job for hand labor and this is the principal part of the work now being done by the Relief Camp forces under Superintendent C. C. Rossi, who was in charge of the camp at Needles last winter.

As the brush will have to be burned during the rainy season in this national forest area, it can be cut and piled during the fall months



TIP TOP SITE of
 Arroyo Seco
 unemployment
 relief camp in
 mountains near
 Pasadena where
 263 single
 itinerants are
 housed while
 engaged in State
 highway work
 without pay.
 Inset is C. C. Rossi,
 camp
 superintendent

STEEP MOUNTAINSIDES covered with a dense growth of brush must be cleared along the line of the highway project. Crews of men with axes cut down the thick chapparal to be carried away and piled by other crews. It is ideal work for hand labor and the men seem to enjoy it, although the footing is somewhat precarious at places, making the work both more arduous and more interesting.



PIONEER TRAIL BUILDING goes hand in hand with the brush clearing operations. These narrow trails and roads are necessary to provide access to the grading work that must be done ahead in certain places. The construction of them affords much work for the pick and shovel gangs.

OVER RIDGES AND SLOPES, the course of the cleared right of way is now marked by huge heaps of brush piled in long windrows. These will be burned during the late winter and early spring, when there is no danger of starting a fire in this part of the Angeles National Forest.



Research Highway Built for Testing Portland Cements in Concrete Paving

By THOS. E. STANTON, Materials and Research Engineer

Seeking answers to many questions concerning the strength, durability, plasticity, curing time and other qualities of the various standard Portland cements used in the construction of concrete pavements an extensive research project has been constructed along the Bayshore Highway near San Francisco. The tests being made with regular and specially installed apparatus supplemented by laboratory investigations to secure data under practical field conditions are described in the following article.

HOW SOON after construction can a Portland cement concrete pavement be safely opened to traffic and, if one of the special, high early strength cements on the market is used to expedite opening, will the strength of the concrete decrease with age and will there be greater volumetric changes with a tendency towards shorter crack intervals?

What cements, if any, are of such quality that though early strengths may be low the ultimate long time strength and durability is higher than for other cements which develop strength more rapidly?

Are any of the standard cements more resistant to the destructive action of sea, acid and alkali waters than others?

Have any cements such relatively higher plasticity and workability that it is possible to manufacture denser and consequently stronger concrete with the use of less mixing water?

To what extent, if any, will the shorter curing period in the case of high early strength cements affect the ultimate strength of the concrete?

UNIVERSITY AIDING

In an effort to secure an answer to these and other perplexing questions which the highway engineer faces in connection with the construction of modern Portland cement concrete highway pavements and structures, an

experimental section of pavement was constructed during August and September, 1932, along a portion of the Bay Shore Highway in San Mateo County just north of South San Francisco.

Even with the greatest of care field studies are difficult to control owing to unavoidable variations in weather and construction processes. For this reason the Materials and Research Department of the California Division of Highways is conducting a rather extensive laboratory test series of the cements used in the test, supplemented by a special laboratory investigation of the concrete making qualities of these cements, conducted under the direction of Professor Raymond E. Davis at the Materials Laboratory of the University of California, at Berkeley, in co-operation with the State Highway Department and the cement companies.



THOS. E. STANTON

This article will not touch in detail on the special laboratory work which is being handled by Professor Davis nor will there be any extensive discussion of the numerous technical details of the field work. Any discussion of such details will be handled in supplemental or special reports which will be issued from time to time.

Intense competition for business has led to the development of numerous brands of cement for special purposes. One cement company



BUILT FOR SCIENCE, this experimental section of a four-lane Portland cement concrete highway, 1200 feet long was recently completed adjoining the Bayshore Highway near South San Francisco. Tests of various qualities claimed for fourteen brands of cement are being made on this and another 1000-foot section by means of special instruments installed in the pavement supplement by specimens and cores taken for laboratory studies.



Making workability tests during construction



Flow test for determining concrete consistency

Spectacular Bixby Creek Bridge

Dedicated With Ceremony and Fete

By G. A. TILTON, Jr., District Construction Engineer

MORE than one thousand people of the California central coast section gathered November 28, 1932, with prominent State, county and city officials, to appropriately dedicate the already widely heralded Bixby Creek Bridge, located twelve miles south of Carmel, on State Highway No. 56 along the Carmel-San Simeon coast.

At noon, in the center of the structure, 270 feet above the ocean, with State Senator E. H. Tickle of Monterey County presiding, speeches were given, officials introduced, and the traditional ribbon severed. Those participating were Timothy A. Reardon, member of the State Highway Commission, representing Governor James Rolph, Jr.; John W. Howe, Secretary of the State Highway Commission; R. M. Dorton, City Manager of Monterey; L. H. Gibson, State Highway District Engineer; F. W. Panhorst, Acting Bridge Engineer, under whose direction the bridge was designed; L. V. Campbell, Office Engineer; Carmel Martin and W. G. Hudson of Monterey; Supervisors A. A. Caruthers, Harvey Abbott, Carl Stanley, and R. A. Sterling of Monterey County.

Little Audrey Mawdsley, daughter of Mr. and Mrs. Peter Mawdsley of Carmel, assisted Timothy Reardon with the final act of severing the silken barrier that officially opened the bridge.

BARBECUE FOLLOWED

Immediately following the dedication ceremonies, a barbecue was given at Pfeiffer's Resort on the Big Sur River, under the auspices of the Pacific Riviera Association.

Opening of the Bixby Creek Bridge, 714 feet long, with its concrete arch span of 342 feet (the longest yet constructed in the West) completes the most costly section of highway on the entire road from San Luis Obispo to Carmel. This structure, combined with its smaller companion, the Rocky Creek Bridge, and heavy grading between them, involves an expenditure of \$340,000 in a distance of 3600 feet, slightly less than three-quarters of a mile.

Unit by unit, and mile by mile, California's last virgin coastal wilderness is being pene-

trated by its first highway—a mountainous region in which no roads exist and only pack trails are known. This rugged territory, once inhabited by Indians and infested by outlaws, was reclaimed by a few hardy pioneers fifty years ago.

HEAVY CONSTRUCTION

Sixty-five miles of the heaviest construction along the most precipitous and roughest part of the Monterey coast, involves the blasting of ten million cubic yards of material to obtain a twenty-foot standard road width; of this amount, seven million cubic yards have already been moved, leaving three million cubic yards yet to be taken out in the remaining 9½-mile gap.

Upon closing of this link within the next 2½ years, 134 miles of State highway will be available for through travel, opening a new field of attractions for the California tourist. From historic Monterey and artistic Carmel, down along the rugged coast to Morro Rock and Pismo Beach, continually varying scenery will greet the traveler.

In Monterey County, unexcelled "Point Lobos" is being acquired for a State park, and in San Luis Obispo County, two miles of coast line near Cambria has already been taken over by the State Park Commission.

There are few who would not find something of interest in the Carmel and San Luis Obispo missions—the Point Sur and Piedra Blanca lighthouses—the spectacular highway structures—the beautiful and irregular coast line—the pounding surf—the redwoods along the Big Sur River—the many deep canyons and streams emptying into the Pacific Ocean, and the extensive flora throughout the length of the road.

SPECTACULAR ARCH

The Santa Barbara National Forest, paralleled by the road, preserves a paradise for the hunter, camper and fisherman that will be readily accessible for all time.

The bridge is an outstanding example of modern concrete arch construction. The arch springs from heavy concrete abutments securely anchored in rock on the precipitous slopes of the canyon nearly 140 feet above

(Continued on page 21)



"RAINBOW ARCH," as the engineers have dubbed the beautiful bridge spanning Bixby Creek on the rugged Carmel-San Simeon coast, was dedicated on November 28th with appropriate ceremonies. The official party shown above at the tape-cutting exercises are: left to right, City Manager R. M. Dorton of Monterey; Supervisor A. A. Caruthers; Senator-elect Edward Tickle; little Audrey Mawdsley, whose father, Peter Mawdsley, secretary of the Carmel Business Men's Association, is partially hidden by State Highway Commissioner Timothy A. Reardon engaged in helping Audrey manipulate the scissors; L. V. Campbell, State Highway Office Engineer; John W. Howe, Secretary of the Highway Commission; District Engineer Lester Gibson and Acting Bridge Engineer F. W. Panhorst under whose supervision this bridge, the longest single concrete arch in the West, was designed. The bridge is 714 feet long, crowned with an arch span of 342 feet. The roadway is 270 feet above the ocean, whose waves break at the foot of the slopes.

32 Federal Aid Projects Under Way

(Continued from page 1)

Three hundred thousand dollars was allotted to day labor for fire and embankment protection adjacent to State highways; this work is under the direction of the Department of Natural Resources and will provide work for several hundred men during the winter months.

FEDERAL AID PROJECTS

The Division of Highways speedily took advantage of the Federal aid funds provided by the Emergency Relief and Construction Act passed by Congress last July. California was apportioned \$4,667,000 of the \$120,000,000 provided by this act and on December 1st the Division had under way 27 contracts, totaling \$3,894,300, being financed with the aid of these Federal funds. Bids will be opened during December for five more projects making the total cost of these 32 Federal aid projects \$4,845,200.

During the past months of 1932, construction has been commenced on many notable highway improvements in the development of California's State highway system.

One of the most drastic changes in the routing of a State highway is being effected on the Redwood Highway between Cloverdale and Hopland in Sonoma and Mendocino counties. The relocation of this section of the scenic Redwood Highway crosses to the east side of the Russian River at Preston, about two miles north of Cloverdale, and follows the river bank to a point just south of Hopland where it crosses again to connect with the existing highway.

ALONG RUSSIAN RIVER

This new alignment will eliminate from this popular recreational highway the eight miles of maximum grade and sharp curvature over the hills between these two towns and opens a new scenic area.

Work now under way on this project involves the grading of a 37-foot roadway throughout the entire distance and the construction of a bridge across Squaw Rock Slide opposite that towering cliff. Construction of the two major bridges across the Russian River and grade separations with the Northwestern Pacific Railroad are involved in the project.

WIDENING YOLO CAUSEWAY

Another improvement of considerable magnitude in the State highway system near Sacramento involves the widening of the causeway across the Yolo By-pass about five miles west of the Capital City on the main artery to the San Francisco Bay area. The present structure was built some 18 years ago and its roadway width of 20 feet has become inadequate and dangerous.

The improvement now under way consists of widening the structure on the southerly side to a new roadway width of 42 feet with a 3-foot sidewalk. The roadway will be surfaced with asphalt concrete and the present bascule span at the easterly end of the trestle will be replaced with a double-leaf lift span. The total length of this causeway is 16,538 feet and its widening will greatly increase the safety of driving for the thousands of motorists who daily travel this important artery.

On the Redding-Alturas lateral in Shasta County four contracts were let during the past year for the construction of that section of this highway between Burney and Fall River Mills, a distance of 18.5 miles. The work involves the construction of a graded road-bed 36 feet wide surfaced with bituminous-treated crushed rock 20 feet wide or an entirely new alignment. Three steel stringer bridges are under way at Hat Creek, Pit River and Fall River. The new location of this primary highway eliminates one of the worst sections between Redding and Alturas.

RIDGE ROUTE ALTERNATE

During the year, grading on the Ridge Route Alternate has been completed. This relocation of the central artery of the State highway system in Los Angeles County is the most drastic improvement in alignment and grade ever undertaken.

It eliminates from the State system the notorious Ridge Route across the mountains which separate southern California from the San Joaquin Valley. The new location follows the canyons westerly of the existing route and provides a modern alignment and grade and at the same time shortens the distance between Castaic School and Tejon Pass by nearly ten miles. Contracts for the 30-foot paving now being placed on the 27 miles of this new route and construction of the seven necessary bridges were awarded during 1931.

Bids are to be advertised this month for the reconstruction and 30-foot pavement of the section of this route from Gorman, where the new alternate connects with the present alignment of the highway, to the northerly boundary of Los Angeles County.

Another improvement of major proportions to be started on the Los Angeles-Sacramento arterial is the construction of the new bridge across the Kern River at the northerly edge of Bakersfield. This structure is being placed on the new alignment of the State highway which is to be constructed cooperatively by the State, the city of Bakersfield and Kern County as a revised routing of this arterial through Bakersfield.

The new bridge is to be 2295 feet long and will consist of steel stringer spans and timber trestle, the deck will be concrete and will provide a clear roadway 40 feet wide with two 4-foot sidewalks.

OLD BRIDGE INADEQUATE

This new river crossing will eliminate from the State highway the existing narrow concrete arch bridge built nineteen years ago by the county and now inadequate for the large volume of traffic carried by this important State highway.

On the new secondary highways which were added to the State road system by the 1931 Legislature, three important contracts were begun on two of these routes in Los Angeles County. On the new State highway lateral which will connect Los Angeles with Pomona, two contracts are under way for grading and paving.

The new highway is being constructed with a 50-foot roadway and a pavement 30 feet wide between Bar-

Major Improvements to Highway System Constructed in 1932

ranca Street and Pomona and between El Monte and Covina. The completion of this new lateral will provide a modern State highway between Pomona and Los Angeles.

The third contract on these new secondary routes in Los Angeles County is for a similar pavement on the six miles from Pomona to the Brea Canyon Road on the Pomona-Fullerton Highway.

PAVING ARTERIAL

An improvement of great interest to the San Francisco Bay region is the construction of a new pavement on the ten miles between the town of San Pablo and the Carquinez Straits bridge in Contra Costa County. This highway is the main route from the bay area to the Napa and Sacramento valleys and carries most of the interstate traffic to Oregon and Nevada. The project, now approaching completion, will provide a 30-foot pavement with 8-foot shoulders over the entire section and eliminate the old rough pavement with its high crown and excessive superelevation on curves.

Other important improvements to the State highway system which have been inaugurated during 1932 include such projects as:

Grading and surfacing 8.5 miles of the Sequoia National Park lateral between Lemon Cove and Three Rivers in Tulare County.

Grading and paving 4.8 miles between Newport Beach and Corona del Mar and 4.9 miles between Laguna Beach and Dana Point in Orange County on the Serra-Oxnard highway.

Grading and surfacing of nearly twenty miles on the Mecca-Blythe lateral in Riverside County.

Grading and paving on 16.5 miles of the San Diego-El Centro lateral between Bostonia and Viejas Creek.

Grading and surfacing on the Los Angeles-Salt Lake highway between Halloran Summit and Mountain Pass in San Bernardino County, a distance of 16.5 miles.

Grading and paving 6.4 miles between Cordelia and Fairfield on the San Francisco-Sacramento arterial in Solano County.

THREE-LEVEL CROSSING

To relieve traffic congestion and increase safety, a three-level highway crossing is in course of construction a short distance outside of Cleveland. Traffic on four routes, East 71st Street, Brecksville, Canal, and Independence Roads, has reached such proportions that the one under-pass constructed a few years ago is insufficient. An elevated crossing will be superimposed.—*Ohio Highways*.

MAKE 'EM BOOSTERS

It is plain that the tourist business is California's most valuable industry. It gives us much and takes little. It should be the business of every Californian to see that every traveler who crosses our State line goes away a booster.—*Santa Rosa Press Democrat*.

MOAN OF THE LOW BIDDER

MY lump sum bid is low, you say?
How much? Five thousand!!! Well,
I'll lay

A bet with anyone that I
Forgot and didn't multiply,
Or else I've left the profit out.
Great balls of tar! That's it, no doubt!

How did the unit prices run?
My gosh! I'm low on every one!!!
I'm low on earth; I'm low on rock;
I'm low on borrow—that's a shock!
They've got my check for ten per cent,
And now I'm stuck, that's evident.

Who's going to inspect the job?
Oh, I know him, the dirty slob!
He wouldn't give a guy a break,
And all he does is bellyache.
Aw, shucks! Come on, let's move some dirt,
Here's one more time I lose my shirt.

—SPENCER A. JONES
in *The Excavating Engineer*.

Great Basin Stream Flow Records Issued

Water Supply Paper 720 of the U. S. Geological Survey has made its appearance containing the records of cooperative stream flow measurements made by the U. S. Geological Survey, the State Engineer's office, and other agencies in the Great Basin during the period October 1, 1930, to September 30, 1931, and it is reported Water Supply Paper 721 containing similar data for Pacific Slope Basins in California is in galley proof and will appear very shortly. All earlier records of cooperative stream gaging have already been published.

The situation today with Water Supply Papers practically current is in gratifying contrast to that which prevailed two years ago when publication was three years in arrears. The State Engineer's office of California, cooperating with other western State engineers through the Association of Western State Engineers, has been instrumental in bringing about this improvement through representations to administrative heads at Washington and to the Congress that no economies were effected by the delay and much inconvenience was resulting to those having need for the data.

"It takes twenty years for one woman to make a man out of her son, and just twenty minutes for another to make a fool out of him."—*Tennessee Road Builder*.

Torrey Pines Grade Eliminated in San Diego Coast Road Improvement

By R. C. MYERS, Assistant Engineer, District VII

ONE OF THE important improvements on the State highway system in San Diego County is the recently completed project in the city of San Diego extending from the northerly city limits to the junction of the La Jolla and Rose Canyon routes. This 4.4-mile project is on the Coast Highway and eliminates the old Torrey Pines grade from that route.

One can not realize the benefit of this improvement unless he has traveled over the old Torrey Pines grade which was one of the most tortuous and dangerous grades on any major highway in the State. The grades were steep and the curves so sharp as to make the sharpest curves on the old Ridge Route seem gradual by comparison.

This grade has been used for many years by all traffic entering or leaving San Diego by the Coast Route. It started at Sorrento Creek and ended several hundred feet higher on the mesa toward San Diego. It lies entirely within the city limits of San Diego, which is the reason this portion of the route was not improved sooner by the State.

COOPERATIVE PROJECT

The project just completed is one of several projects under which the State and the county of San Diego are cooperating with the city of San Diego in improving the northerly entrance to the municipality. The city made the surveys and plans and with county aid handled the contract for the grading work. The plans were made in accordance with modern State highway standards and were approved by the State.

On this roadbed, graded under a city contract, the State is planning a new 30-foot pavement from the northerly city limits to the mesa above the grade where the new line connects with the old.

From this point the old pavement was flanked on either side by a row of trees which it seemed desirable to save. To increase the width of the old pavement to 30 feet would necessitate removing one row of trees. In order to avoid doing this the old pavement was widened from 16 to 20 feet

and a new 20-foot strip of pavement was placed easterly of the old right of way. This results in two 20-foot pavements with a row of trees between and also a row of trees along the westerly side of the west pavement strip. The westerly pavement is used for southbound traffic, while the easterly pavement is reserved for northbound traffic.

The construction work presented no unusual difficulty with the exception of the problem of maintenance of traffic. During paving operations the Olympic games were in progress in Los Angeles and an unusually heavy volume of traffic was carried past the work. It has been estimated by the San Diego Police Department that during the 77-day period during which paving operations were being carried on, 375,000 cars passed along this section of the highway. A number equal to several times the daily average passed on Sundays and holidays, particularly on Labor Day.

TRAFFIC MADE SAFE

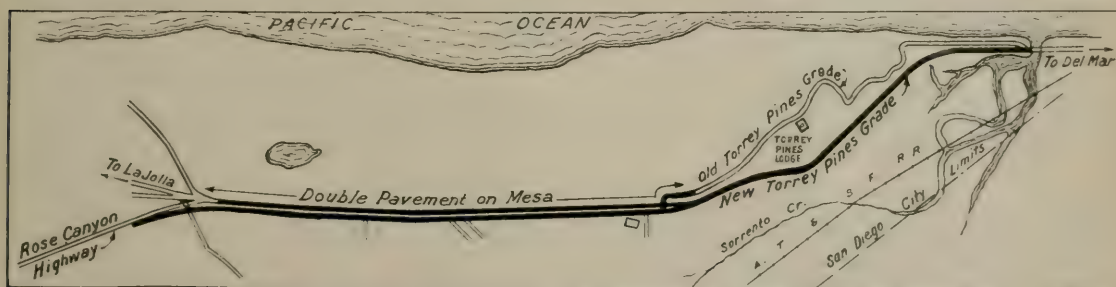
Construction work was carried out with the thought of providing a maximum degree of safety and a minimum of inconvenience and delay to the motorists using this road. The city of San Diego provided motored road maintainers and water tank trucks which were used to keep the detours in excellent condition at all times. On holidays, traffic was directed by a very efficient squad of motorcycle police of the city of San Diego. In general, the work of maintaining detours and directing traffic was under the supervision of the resident engineer of the State Highway Department, who had charge of this contract.

This phase of the work was considered so important that \$4,600 was expended by the State and \$3,200 by the city for the construction and maintenance of detours and the direction and control of traffic. How efficiently this work was carried on is best shown by statistics of the San Diego Police Department.

In 1931, from August 1st to October 15th, before starting the above described work and with traffic estimated at 20 per cent less than for the corresponding period in 1932, 28



GONE ARE THE CURVES of yesteryear that made the steep climb up the Torrey Pines grade a bugbear to motorists on the Coast Highway at the northern city limits of San Diego. A new, wide highway has replaced the old grade. No. 1 shows the junction of the Rose Canyon and La Jolla routes. No. 2 is a view looking south at the new grade. No. 3 shows the two one-way traffic roads at the top of the grade and No. 4 shows portions of the old and new highways at a point 500 feet north of the top of the new grade.



Map of the Torrey Pines grade relocation within San Diego City.

C. H. Pope Speaks at Asphalt Conference

"California has contributed a more varied record of highway progress than any other state," said J. E. Pennybacker of New York, on announcing that California's State Highway Engineer, C. H. Purcell, had accepted an invitation to have State Construction Engineer C. H. Pope address the Tenth Annual Asphalt Paving Conference at New Orleans, December 5-9.

"Not only has California pioneered in machine finished asphalt surfaces," said Penny-

backer, "but it has added much toward the development of economical low-cost paving methods. At the same time California can not help but gain from Mr. Pope's discussions with the many other outstanding engineers from progressive road-building states, in attendance at the conference."

Didn't Take Long

Wife: "You didn't marry a cook!"

He (bitterly): "No, I found that out a long time ago."—*Borrow Pit.*

Policeman—Miss, you were doing 60 miles an hour.
Fair Motorist—Oh, isn't that splendid, I learned to drive only yesterday.

U. S. Engineers Investigate State's Great Central Valley Water Plan

THE Board of Engineers for Rivers and Harbors of the U. S. War Department spent ten days in California during November for the sole purpose of studying and investigating the Great Central Valley Project of the State Water Plan. The visit of this important engineering board of the Federal Government is a direct result of a special committee dispatched by Governor James Rolph, Jr., to Washington, D. C., in June, 1932, to appear before that board.

This is the third Federal body which has investigated California's water projects during Governor Rolph's incumbency, resulting from the activities of his committees. The House of Representatives Subcommittee on Appropriations for the Department of the Interior made an inspection trip in July, 1931, and the U. S. Senate Committee on Irrigation and Reclamation spent four days in September of this year on the same mission.

It is apparent that the United States Government is cooperating fully with the State agencies in working out a practicable solution to California's water problem.

ADVISES CONGRESS

The Board of Engineers for Rivers and Harbors is a permanent board composed of officers of the U. S. Corps of Engineers who have had wide and varied experience on engineering work. It is the technical adviser of Congress in matters pertaining to flood control and navigation wherein there is a Federal interest. The recommendations of the board are given very serious consideration by the Congress.

For the past three years the Corps of Engineers of the United States Army, under congressional authorization, has been conducting an investigation of the Sacramento and San Joaquin rivers to formulate plans for the most effective improvement of these streams for navigation; the prosecution of such improvement in combination with the most efficient development of the potential water power; and for control of floods and needs of irrigation.

The investigation was carried out under the able direction of Lieut. Col. Thomas M. Robins, Division Engineer of the Pacific Division, who rendered his report to the Chief of Engineers in March, 1932. The report contains conclusions and recommendations as to the best plans of development and, of particular importance to California, recommendations as to the interest of the Federal Government in the development of these streams and the amount of Federal financial participation which would be warranted.

PLANS COINCIDE

As far as the physical plans of development are concerned, these recommendations are practically identical with the plans recommended by the State Engineer after over ten years of intensive investigation. The engineers of the War Department have carefully reviewed all studies made by the State and approved the engineering plans and cost estimates.

The Division Engineer's recommendations, however, as to the extent of the Federal interest and the amount of Federal financial participation justified in the project are not in accord with what the State believes to be the justified interest and responsibility of the Federal Government.

A special committee was appointed by Governor James Rolph, Jr., to go to Washington to present an appeal from the conclusions of the Division Engineer. A hearing was held on June 27 and 28 before the Board of Engineers for Rivers and Harbors, charged with the duty of reviewing all reports of the War Department before final consideration by the Chief of Engineers in the latter's recommendations to Congress. It developed that the questions involved were of such great importance that the Board of Engineers accepted the suggestion of the State's representatives to make a personal investigation of the Great Central Valley Project before arriving at its final conclusions and recommendations.

The investigation started in Bakersfield on November 9th with an inspection trip through



AMABASSADORS OF GOOD WILL from the Government at Washington, these members of the Board of Engineers for Rivers and Harbors of the U. S. War Department, spent ten days in California studying the Great Central Valley Project of the State Water Plan during November. At Sacramento they were guests aboard the Delta King during a trip on the river. In the group are (left to right): Col. George W. Hoffman, Col. William J. Barden, Col. Edward H. Schulz, Lieut. Col. Warren T. Hannum and Col. Thomas M. Robins, Division Engineer, Pacific Division.

the Sacramento and San Joaquin valleys as far north as the Kennett dam site on the Sacramento River, and culminated in a public hearing held in the State Capitol at Sacramento on November 17th. Five out of seven members of the board took part in the investigation, comprising the following:

Col. William J. Barden, senior member of the board; Col. Edward H. Schulz, Col. George M. Hoffman, Col. Thomas H. Jackson, Lieut. Col. Warren T. Hannum.

The board was accompanied by Lieut. Col. Thomas M. Robins, Division Engineer, who sat as a member of the board at the public hearing; Capt. J. C. Drinkwater, District Engineer, Sacramento District; Lieut. Conrad P. Hardy of the San Francisco district office; C. I. Grimm, principal engineer, and Arnold Weeks, senior hydraulic engineer from the office of the Board of Engineers of Washington, D. C. Many Federal and State representatives met with the board.

Congressman Albert E. Carter of Oakland, member of the River and Harbor Committee of the House of Representatives, accompanied the party throughout its trip and attended the public hearing in Sacramento. Senator Bradford S. Crittenden, chairman; Assemblyman Robert L. Patterson, secretary; and Assemblyman Edward Craig, member of the California Joint Legislative Committee, and James M. Burke, A. B. Tarpey and Jesse Poundstone, members of the California Water Resources Commission, met with the board on

its trip. Regional Engineer E. W. Kramer of the U. S. Forest Service, representing the Federal Power Commission in California, accompanied the party.

MEETINGS EN ROUTE

Meetings were held en route at Bakersfield, Visalia, Fresno, Stockton, Woodland, Redding and Red Bluff, under the auspices of local chambers of commerce, and were attended by representative citizens in and near these communities.

On November 11, the Stockton Chamber of Commerce conducted the board on a trip of inspection of the Stockton Ship Canal and the delta region on the river steamer *Fort Sutter*. Luncheon was served during the trip. At Sacramento, November 16, the board was entertained by the River Lines at a luncheon served on board the palatial river steamer *Delta King* during a two-hour trip on the Sacramento River.

Following the public hearing at Sacramento on November 17th, the Sacramento Chamber of Commerce gave an informal dinner at the Sutter Club attended by Governor James Rolph, Jr., and Director of Public Works Earl Lee Kelly.

The board inspected the Kennett and Friant dam sites and the lines of the proposed conveyance conduits, studied the plans for improvement of navigation and flood control on the Sacramento and San Joaquin rivers and examined the areas of deficient water supply to be served under this initial Great Central Valley Project.

Water Plan Stated at Public Hearing

(Continued from page 13)

At the public hearing at Sacramento, the State's contentions as to the importance and need of the Great Central Valley Project and the extent of Federal interest and responsibility justifying the financial participation of the Government was presented at an all-day session. Governor James Rolph, Jr., opened the hearing and extended the board a cordial welcome, expressing the appreciation of the State for the investigation being made. Earl Lee Kelly also addressed the board.

Other speakers at the hearing included: Edward Hyatt, State Engineer; Francis Carr, member of California Water Resources Commission, Redding; Stephen W. Downey, attorney for State Reclamation Board, Sacramento; W. P. Dwyer, president of The River Lines, Sacramento, Stockton and San Francisco; W. G. Stone, manager of transportation, Sacramento Chamber of Commerce; Walter B. Hogan, City Manager of Stockton; George A. Atherton, general manager, California Delta Farms, Inc.; C. W. Schedler, vice president and general manager, Great Western Electro-Chemical Company and president, Association of Industrial Water Users of Contra Costa and Solano Counties, Pittsburg and San Francisco; James M. Burke, member, California Water Resources Commission and Tulare Water Commission, Visalia; Senator Bradford S. Crittenden, chairman, California Joint Legislative Water Committee, Stockton; Arthur B. Tarpey, member, California Water Resources Commission, and president of Fresno Irrigation District.

ORGANIZATIONS REPRESENTED

Others who appeared to emphasize the importance of the Great Central Valley Project and the Federal interest therein were:

California State Chamber of Commerce, represented by A. E. Roth; Los Angeles Chamber of Commerce, represented by George H. Cecil; San Francisco Chamber of Commerce, represented by H. W. Crozier; Junior Chamber of Commerce of San Francisco, represented by Victor T. Comer; Oakland Chamber of Commerce, represented by Charles H. Lee; San Joaquin Valley Water Committee, represented by M. P. Lohse; Kern County Water Development Commission and Kern County, represented by Hugh S. Jewett, Chairman of Commission; Salt Water Barrier Association, Inc., represented by T. M. Carlson; City of Fresno, represented by Gene Vincenz, Commissioner of Public Works.

Congressman Albert E. Carter of Oakland, Congresswoman Florence P. Kahn of San Francisco, and Congressman-elect Frank H. Buck of Vacaville, attended the public hearing and spoke.

Addresses and statements were made also by prominent citizens and representatives of important interests of the State as follows:

W. H. Kirkbride, chief engineer of Southern Pacific Company; P. M. Downing, vice president and general manager, Pacific Gas and Electric Company; M. M. O'Shaughnessy, consulting engineer, Public Utilities Commission, San Francisco; T. I. Phillips, assistant chief engineer, Western Pacific Railroad Company;

STATEMENTS MADE ON TRIP BY MEMBERS OF BOARD OF ENGINEERS

The attitude of the Board of Engineers for Rivers and Harbors with respect to California's water plan is well set forth by the following statements of the members of the board which have been quoted during the trip of investigation:

BY COL. WILLIAM J. BARDEN, senior member:

"I believe the water plan that has been worked out is the best plan that could have been devised. The Federal interest in waterways is primarily that of navigation. We will go as far as we can toward bringing a solution of your problems, as far as our responsibility to the Federal Government will permit."

BY COL. EDWARD SCHULZ:

"We are in earnest in coming here. We are approaching this matter with an open mind. You can not idly sit and see this water going to the sea without its beneficial use. There must be some way to work out this problem. Recently we heard much of a slogan, 'Beer by Christmas.' What you need is another slogan, 'Water by New Years!'"

BY COL. GEORGE M. HOFFMAN:

"I don't know of any problem within the past year, the time I have been a member of the board, that received the attention that this one is receiving now. It is proper that California should ask the Federal Government to assist in her water problems."

BY COL. THOMAS H. JACKSON:

"You have a problem of the greatest magnitude and one that is exceedingly interesting to every one of the Board of Engineers. It is of the greatest importance to the future of California and, if and when the project is constructed, it is certain to result in increased prosperity. We have a very sympathetic attitude toward your project. We have, however, a duty to fulfill toward our employer, the United States Government. If we should find your proposed development is one that the United States Government should participate in, we shall be greatly pleased to so recommend."

Lester S. Ready, consulting engineer and former chief engineer of State Railroad Commission; E. W. Kramer, regional engineer, U. S. Forest Service and representative of Federal Power Commission in California.



WELCOMING THE ENGINEERS to Sacramento, State officials joined them on a river trip. In the group above, left to right, in the front row, are Lieut. Col. Hannum, State Engineer Edward Hyatt and Deputy Director of Public Works Eric Cullenward. Standing, left to right, are Col. Hoffman, E. Raymond Cato, Chief of California Highway Patrol; Congressman-elect Frank H. Buck, Earl Lee Kelly, Director of Public Works; Congressman Albert E. Carter of Oakland, member of the House Committee on Rivers and Harbors; Col. Schulz, Rolland A. Vandegrift, Director of Finance; Col. Jackson and Capt. J. G. Drinkwater, Division Engineer, Sacramento District, U. S. War Department.

The hearing was attended by nearly 100 citizens, representing practically all of the important interests in the State.

It is hoped that this personal investigation by the board will result in recommendations to Congress for a more liberal Federal financial participation in the project than heretofore recommended.

Congressman Albert E. Carter made this very significant statement at the public hearing in Sacramento on November 17th:

"I consider it one of the great and important problems here in the West and I have been pleased and delighted that the board has been enabled to come here. I have been gratified at their intense interest in this matter and I am sure that the interests of the State of California are going to be given full consideration by this board."

BALANCE AGAINST CALIFORNIA

How much do you really know about the scenic and recreational attractions of your own California?

This is the query put to motorists, following a recent report by the United States Bureau of Public Roads showing that mileage traveled in other states by motorists from California is more than twice as great as the mileage traveled by visiting motorists in this State.

While motor tourists from California were traveling 839,325 miles a day in states other than their own during the period covered by the report, only 411,600 miles were being traveled in California by motorists from other states.

Road Upkeep Urged to Prevent Losses

IN OPENING a campaign to bring to the attention of the nation the risks that lie in too severe contraction in State, county and city budgets, T. H. Cutler, president of the American Road Builders' Association, points out that not only has new highway construction been affected but that destruction of those already built is inevitable if upkeep is neglected.

"The profits of adequate investment in maintenance of present highways are too great to be ignored regardless of the situation of economic stress which unquestionably exists at the present time," says Mr. Cutler.

"The value of sound maintenance to transportation should be sufficiently obvious to require no elaboration. With the cost of traffic accidents estimated at \$900,000,000 yearly, we are in an excellent way to increase it by reducing highway maintenance expenditures which can only mean an increase in operating hazards due to neglected road conditions."

Coast Road Improved for Ten Miles

(Continued from page 10)

major motor vehicle accidents occurred within the limits of this contract with no highway work under way.

ONLY ONE ACCIDENT

During the corresponding period in 1932, though construction work was in progress, only one accident occurred at a total cost of \$305. Statistics indicate that the average cost of major highway traffic accidents is \$301. On this basis, a saving of \$8,127 has been effected by the careful control of traffic on this contract, which is \$327 more than the cost of traffic maintenance, without attempting to place a monetary value on the inconvenience and possible loss of life which would have resulted if a considerable number of accidents had occurred.

On entering San Diego from the north, one now notices a vast improvement, starting from Del Mar where a 0.75 mile contract has recently been completed for widening the pavement to a 30-foot width and improving alignment. This extends to the new Sorrento overhead crossing of the A. T. & S. F. Railway which is now under construction and which will be completed about June, 1933. At the southerly end of this overhead railroad crossing the new improvement, previously described, which eliminates the old Torrey Pines grade from the route, extends for 4.4 miles to the junction of La Jolla and Rose Canyon highways.

At this point one has the choice of two routes—the La Jolla or scenic route, and the Rose Canyon or commercial route. The latter is the shorter and more direct route and extends for 5.42 miles to Balboa Avenue. This was a cooperative project in which the city and State cooperated and was completed in December, 1930. The scenic route, although somewhat longer, affords the opportunity of seeing La Jolla, one of the most beautiful suburbs of San Diego, with its picturesque homes and cliffs fronting on the ocean.

TEN MILES IMPROVED

The State has spent \$372,000 on the three projects already completed and is spending \$108,000 on the Sorrento overhead railroad crossing now under construction, making a total of approximately \$480,000 which the State has allocated up to the present time

for the improvement of the northerly gateway to San Diego. These improvements form a continuous stretch of modern highway, 10.57 miles in length, from Del Mar to Balboa Avenue in San Diego. Plans are being prepared for still another project, extending from Balboa Avenue along the easterly end of Misison Bay to Atlantic Street, which will further improve this entrance to San Diego.

One of the most interesting features of this entrance to San Diego is the proposed roadside beautification being sponsored by the San Diego Conservation Society, the San Diego Chamber of Commerce and the San Diego City Park Department. This development is to start at the north city limits and extend to Lindbergh Airport, a distance of 14 miles. From the north city limits to the foot of the new Torrey Pines grade, the shore line is to be maintained as a public bathing beach, while the low flat land to the east is to be developed into a noncommercial auto parking and recreational area.

EXTENSIVE PLANTING PLAN

From the foot of the new grade to the mesa above, native shrubs, ice plant, Torrey Pines and wild flowers are to be planted. On the mesa the two rows of trees are to be preserved and a third row planted along the east side of the east pavement. The areas between the trees are to be planted to native shrubs and flowers.

This plan of planting is to be carried out along the Rose Canyon route and across Mission Bay to Lindbergh Field on the proposed Atlantic Boulevard extension. The alternate scenic route through La Jolla needs no additional beautification. This planting plan, when completed, will give a well-groomed appearance to the roadsides, with a profusion of trees and shrubs. San Diego will have an entrance which will be a source of pride not only to the city but to the entire State as well.

All that most foreign countries ask of Uncle Sam is to be left a loan.—*Dallas News*.

Mrs. Lewis—You say you can't stop the car! Good heavens!

Lewis—It doesn't make any difference—there's no place to park, anyway.—*National Motorist*.

New Print Shop Building Dedicated to Taxpayers by Governor Rolph

"IF I could find a job for every man out of work in the State it would be the happiest thing in my life."

This was the declaration made by Governor James Rolph, Jr., in his speech at the dedication of the new addition to the State Printing Plant at Sacramento on November 15th, in referring to the unemployment situation and the relief being given by State construction activities.

"Sixty per cent of the money spent on this building went to Sacramento workmen," he added. "Probably nowhere else in the Union are people witnessing such a ceremony as this. It is a heartening thought that California has confidence. I dedicate this building to the taxpayers who made its erection possible."

An audience of more than a thousand persons filled the second floor of the new building at the dedication exercises. Brief addresses were made by Director of Public Works Earl Lee Kelly, Rolland A Vandegrift, director of finance, and J. M. Welsh, superintendent of the printing plant, who acted as chairman in place of State

Printer Harry Hammond, absent through illness.

Others on the speakers' platform included James Cremin of Marysville, former State Printer; Harry Orman, foreman of the composing room; Daniel Sullivan, oldest member of the plant staff, about to be retired on pension as press room foreman; Mayor C. H. S. Bidwell of Sacramento; R. E. Golway, Sacramento County Superintendent of Schools; Russell Bevins, Registrar of Motor Vehicles; Eric Cullenward, Deputy Director of Public Works, and William Arnold, foreman of the bindery.

Musical numbers were furnished by State Employees Association Orchestra and glee club quartette and the De Molay Band.

The new building is a three-story

steel and concrete structure erected at a cost of \$132,000 and so constructed that an additional story may be added. It is 50 by 160 feet in dimensions and makes the State Printing Plant the largest of its kind west of Chicago, employing approximately 265 workers.



LEARNING HIS LETTERS on a linotype machine, Governor James Rolph, Jr., picked out a line assisted by Miss Laura Hammond, daughter of State Printer Harry Hammond, and J. M. Welsh, plant superintendent, at the dedication of the new \$132,000 addition to the State Printing Plant in Sacramento.

Eighteen Major Projects Advertised With Estimated Cost of \$2,400,000

HIGHWAY construction projects estimated to cost \$2,400,000 were planned for advertising during the month of November by C. H. Purcell, State Highway Engineer and Chief of the Division of Highways, according to his monthly report to Earl Lee Kelly, Director of Public Works.

This advertising program included 18 major projects composed of 15 road projects and three bridge projects. The road improvements cover work on approximately 56 miles of State highway and amount to an estimated cost of \$2,232,000. The three proposed bridge projects will involve the construction of five structures, estimated to cost approximately \$168,000. The work is distributed well over the State and will involve construction in 14 counties.

Mr. Purcell reported rapid progress in getting under way projects to be financed with the assistance of the \$4,600,000 Federal aid funds allotted to California from the money provided by the Emergency Relief and Construction Act, 19 of these relief projects having been advertised, or let to contract.

Fourteen emergency projects estimated to cost \$2,040,500 were included in the 18 projects prepared for November advertising. These 14 projects are indicated on the accompanying detailed tabulation.

PROGRAM UNDER WAY

The Division of Highway's program for direct unemployment relief is now well under way. This program is being financed from funds allocated by the California Highway Commission in the sum of \$1,350,000. Of this amount \$120,000 was set aside for the operation of a labor camp for 250 itinerant laborers in the Arroyo Seco in Los Angeles County and \$1,230,000 has been distributed among the 10 districts for the expansion of maintenance crews to give work to 3000 family men for a six months' period.

Following are brief descriptions of a few of the important projects advanced to November advertising. They cover work in 14 counties.

In Lassen County it is proposed to construct a new graded roadway section easterly of

Susanville on the Susanville lateral. The work on this small project will be performed largely by hand labor methods and will provide employment for a considerable number of men. The work will commence at a point 2.5 miles easterly of the city limits of Susanville and will extend for nearly two miles to Johnstonville. The improvement plans the widening of roadbed from 22 feet to 30 feet and importing and placing more suitable material for the grade than is available on the roadway. Alignment, grade line and drainage will also be greatly improved.

ARTERIAL IMPROVEMENT

From the Glenn-Tehama County line it is proposed to reconstruct the West-Side Pacific Highway over the 8.9 miles to Corning. This section of the main State route from Sacramento to the north was constructed some 17 years ago and the 4-inch concrete pavement, without reinforcing, has disintegrated under the impact of present day traffic. It is now proposed to reconstruct the grade to a 36-foot roadbed width and place an asphalt concrete pavement 20 feet wide. The improvement will smooth out the grade line and will connect at both ends with modern pavements. The project will mark another step in the modernization of California's arterial highways.

That short link of State highway in San Joaquin County which connects the Los Angeles-Sacramento arterial at Manteca with the Oakland-Stockton lateral at the Mossdale bridge is to be reconstructed and paved with Portland cement concrete pavement. The present old bituminous treated surfacing will be salvaged for the construction of adequate 8-foot shoulders on each side of the proposed 20-foot pavement. While this route is only about five miles long, it carries most of the traffic using the Valley route from the south to the San Francisco Bay area, thereby forming an important link in the State highway system.

ENDS GRADE CROSSINGS

An important improvement to the Los Angeles-Sacramento arterial is to be made to this heavily traveled highway at the southerly

Work Advanced to Bids in November

Major highway improvements advertised by the Division of Highways during the month of November included 18 projects in 14 counties carrying an estimated total cost of \$2,400,200. These projects include 15 road jobs covering some 56 miles and 5 bridges. In the list were 14 projects financed with the aid of Federal Emergency Relief funds.

DETAILED LIST OF PROJECTS

County	Location	Miles	Type
*San Diego	Alpine to Viejas Creek	4.4	Port. Cem. Con. Pave.
*Alameda	Dublin to Castro Hill	6.7	Port. Cem. Con. Pave.
San Joaquin	Manteca to Mossdale	4.3	Port. Cem. Con. Pave.
*Merced	Merced to Merced Airport	0.6	Port. Cem. Con. Pave.
*Stanislaus	Hatch Crossing to Modesto	1.4	Port. Cem. Con. Pave.
*Los Angeles	Gorman to Northerly Boundary	3.8	Port. Cem. Con. Pave.
*Los Angeles	Oaks to Vasquez Rock Road	1.5	Port. Cem. Con. Pave.
*Los Angeles	Tajunga to La Canada	4.0	Asphalt Conc. Pave.
*Marin	Waldo to Sausalito	2.1	Asphalt Conc. Pave.
*Ventura	Santa Clara River to Ventura	4.0	P. C. C. widening and Asphalt Conc. Pave.
*Tehama	Southerly Boundary to Corning	8.9	Asphalt Conc. Pave.
*Mono	Whiskey Creek to Convict Creek	4.3	Bit. Tr. Cr. Rk. Surf.
Lassen	Susanville to Johnstonville	1.9	Graded Roadbed
*Inyo	Keoughs Hot Springs to Bishop	6.3	Graded Roadbed
Los Angeles	Santa Ynez Canyon to Santa Monica Canyon	1.5	Removing earth slides
*Kern	Between Union Ave. and Oil Junction	2	Reinf. Conc. Bridges and 5 R. C. Box Cul- verts
Kern	Across Caliente Creek and Walker Basin	2	Timber Bridges
*San Bernardino	Across Mojave River at Barstow		Steel Bridge

*Federal Emergency Relief Fund Project.

SUMMARY

Type	Miles	Amount
Portland Cement Concrete Pavement-----	22.7	\$1,212,500
Asphalt Concrete Pavement-----	19.0	711,000
Bituminous Treated Crushed Rock Surfacing-----	4.3	52,000
Graded Roadbed-----	9.7	256,500
Bridges -----	(5)	168,200
Totals -----	55.7	\$2,400,200

Many Skilled Men Seek Relief Camp

(Continued from page 2)

in readiness to be burned during the late winter or early spring. This will fit in nicely with plans for the future grading contract as the new right of way will have been completely cleared of brush by the time this contract is awarded.

DOING PIONEER WORK

In addition to the clearing work, some pioneer roads and trails are being built by hand labor. After the clearing has been done and the necessary pioneer roads and trails built, any further time will be devoted to grading work on the highway section proper. This grading work will be confined to such portions as can be done with hand-shovels and wheelbarrows.

In October, 1932, the present organization was started with a skeleton force of paid employees, consisting of one superintendent, one senior foreman, four junior foremen, one commissary man and one cook. The bulk of the personnel is furnished by the Welfare Department of the City of Los Angeles and is composed of single transients who have no dependents.

The first contingent, composed of nineteen men, arrived in camp October 14th. They were put to work cleaning, scrubbing and burning rubbish. Simultaneously a group of carpenters was put to work repairing the bunkhouses which had been damaged to some extent by the heavy winds of the last two winters. Additional contingents of men were taken in as rapidly as they could be accommodated until, by the last of October the camp was occupied to capacity. Its population on November 12th was 263 men.

MANY SKILLED MEN

In this group are men skilled in nearly every trade imaginable. A competent nurse was found and a small first aid hospital was established. There are a few capable assistant cooks, a barber who cuts the men's hair, a cobbler to repair their shoes, a tailor to repair and clean their clothes, and a laundryman to wash bedding. In addition to this there are carpenters, blacksmiths, plumbers, electricians and men skilled in clerical work.

As men are admitted to the camp they are required to pass a medical examination and bathe. Each man is furnished underwear,

two pairs of socks, work shoes, overalls, jumper, towel and bedding consisting of one woolen blanket, one cotton blanket and pillow slip. The clothes which the men wear into camp are checked in, cleaned and repaired when necessary so that in most cases the men leave camp with their clothes in better condition than when they enter. The sleeping quarters are rooms twenty feet square, well ventilated, and accommodate from eight to ten men. Recreation in camp consists of the radio, cards, horseshoes and reading.

ENJOY THE WORK

In spite of the hard character of the work, the men seem to enjoy it. They are quartered and are working in one of the most scenic sections of mountainous territory in southern California. Excellent meals are served of an abundance of well cooked, wholesome food. Tobacco is issued. Working hours are short, being six hours per day, six days per week.

It has been hoped that the capacity of the camp could be increased to 350 men, but as yet this matter has not been definitely decided on. Funds for the work are limited, the appropriation to date being \$50,000. The money is being expended in a manner to insure the greatest good being done to as many individuals as possible as well as to the State as a whole.

Superintendent Rossi reports under date of November 12th that the men had cleared about 16 acres and built 12,000 feet of trails in a total of 4443 men-days.

29,000,000 MOTORISTS VISITED NATIONAL PARKS

More than one-fourth of the population of the United States was represented in the grand total of recreational visitors to National forests in the United States last year, reports the California State Automobile Association. Recreation seekers and transient travelers to the forest areas totalled 32,228,613 persons and of this huge number 92 per cent were motorists using the State highways to reach the parks.

Mother—"Mary, come upstairs immediately."
Mary—"But I'm all wrapt up in my problem."
Mother—"Tell him to go home."

"Pop," said son, "how soon will I be old enough to do as I please?" Pop replied, "I don't know. Nobody has ever lived that long yet."—*Santa Cruz Sentinel.*

U. S. Survey Shows 45 to 60 Per Cent Traffic Gain by 1940

TRAFFIC on the Federal-aid highway system in 11 western states, will, in general, increase by 45 to 60 per cent in the period 1930 to 1940, according to a report issued by the U. S. Bureau of Public Roads. The Federal-aid system is approximately 7 per cent of the total rural road mileage in each of these states and is made up of the important State and interstate routes.

This report is the result of a traffic survey conducted from September, 1929, to October, 1930, in cooperation with the highway departments of Arizona, California, Colorado, Idaho, Nebraska, New Mexico, Nevada, Oregon, Utah, Washington and Wyoming. The investigation was undertaken to obtain essential facts about the present density, type, capacity and distribution of traffic units as a basis for planning highway development to serve present and future traffic.

The data presented in the report may be used by each of the states as the basis for the preparation of a program of road construction, reconstruction and maintenance consistent with traffic requirements for each year up to 1940.

ROUTES CLASSIFIED

The routes of the Federal-aid system are classified as having light traffic when there are less than 600 vehicles per day; as having intermediate traffic when there are between 600 and 1500 vehicles per day; and as having heavy traffic when there are more than 1500 vehicles per day. In 1930, 11.3 per cent of the mileage carried heavy traffic, 18 per cent carried intermediate traffic, and 65.9 per cent carried light traffic.

For 1935 the indicated figures are 14.0 per cent, 22.1 per cent and 59.1 per cent. For 1940 they are 16.0 per cent, 25.0 per cent and 54.2 per cent. During the 10-year period the heavy traffic roads will increase by 1670 miles, the intermediate traffic roads by 2534 miles, and the light traffic roads of the Federal-aid highway system will decrease by 4204 miles.

BIXBY CREEK BRIDGE DEDICATED

(Continued from page 6)

the creek, and rises another 120 feet to span the 342 feet from center to center of abutments. The arch ribs, which appear in the picture to be thin and rather fragile, are actually five feet thick at the crown, nine feet at the springing line, and each four and one-half feet wide. The three 40-foot approach spans on the south and the six 40-foot spans on the north bring the total length of bridge to 714 feet. Over 6600 cubic yards of concrete—860 in the arch ribs alone—600,000 pounds of reinforcing steel and 4700 cubic yards of excavation were the principal items in the contract.



CHARLES H. PURCELL
State Highway Engineer

National Organization Again Picks Purcell

AT THE eighteenth annual meeting of the American Association of State Highway Officials held in Washington, D. C., from November 14th to 19th, California's State Highway Engineer was honored by being reelected to the Executive Committee of the Association.

The Executive Committee of the American Association of State Highway Officials is composed of only 11 members. It directs and conducts the business of this active organization which is the vitalizing influence in promoting uniform standards of highway procedure and construction throughout the entire United States.

In view of the great responsibility that is invested in this Executive Committee, the reelection of Mr. Purcell to another four-year term is significant of the esteem in which he is held by this national body for his ability and leadership.

"Before he married he said he would be the boss or know the reason why."

"And now?"

"He knows the reason why."

Old Bridge Transformed Into Modern Structure by Turning It Upside Down

By L. C. HOLLISTER, Associate Bridge Designing Engineer

MORE than ever before, economy has become the watchword of the Bridge Department. This is true from the Bridge Engineer on down to the designers and field men. The designers are extending themselves to see that the most useful and serviceable structure can be built with the most economy, while field men are sending in schemes and ideas for cutting down costs.

An interesting example of how a substantial saving was made, is one in which an old and abandoned bridge was moved to a new location, turned upside down, and a new 34-foot concrete floor placed on what was once the bottom of six 80-foot plate girders.

On the relocation of the Ridge Route between Los Angeles and Bakersfield, where many steep grades and sharp curves have been eliminated, there are seven bridges, four across Piru Creek, one across Gorman Creek, and two across Los Alamos Creek. At Los Alamos Creek, Station 83, it appeared from the field data submitted, that a structure about 220 feet long, consisting of approximately one 80-foot and two 70-foot spans would be required.

SALVAGED OLD GIRDERS

At Castiac Creek on the Los Angeles end of the line change there were thrown out of use, due to improved alignment and grades, three 80-foot steel girder spans. These girders were of the "thru" type, that is, the narrow 21-foot roadway passed through the girders, the girders taking the place of a railing.

The girders, however, were in excellent condition and being of practically the same length as those required at Los Alamos Creek, it was conceived that these girders might in some way be made use of at the new location.

Accordingly, preliminary investigations were made to see if such a thing would be feasible and practical, and preliminary estimates were made to see if it would be more economical to move the old girders than to build entirely new ones. These investigations and estimates showed that it was both practical and economical to move the old girders and refabricate them to meet the new conditions.

The work consisted of the following:

1. Removing old concrete floor.
2. Dismantling and removing old girders, floor beams and bracing.
3. Transporting old structural steel to the new location.
4. Fabricating the old steel to meet the new requirements and conditions.
5. Erecting the steel on the new piers and abutments.

BIG WRECKING JOB

Removing the old concrete floor was done with air drills and hammers, care being taken not to injure the structural steel.

Dismantling the structural steel was more of a job, as about 4500 steel rivets had to be removed in order to disconnect the floor beams and bracing and to divide each girder into two parts so that they could be transported.

Transporting the steel to the new location was done by trucks and trailers. The traffic law requires that no vehicle plus the load shall exceed a length of 75 feet. This meant that the 80-foot girders had to be cut at the splices and hauled in separate pieces.

After the old steel arrived at the new location, the fabrication was started. New steel plates and angles were added to form new brackets and new bracing and 1300 holes were drilled through the old steel to form connections for the new steel. The old bearing shoes were removed from the bottoms of the girders and put on the tops.

NOW UPSIDE DOWN

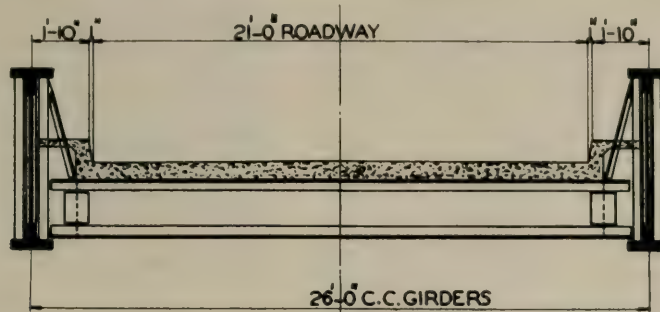
Erecting the refabricated girders on the new piers and abutments followed. This time they were erected completely upside down compared to their original position. Following the erection the steel was thoroughly cleaned, sand blasted, and given three new coats of paint.

The new roadway consists of a 34-foot wide concrete floor with concrete curbs and redwood timber rails.

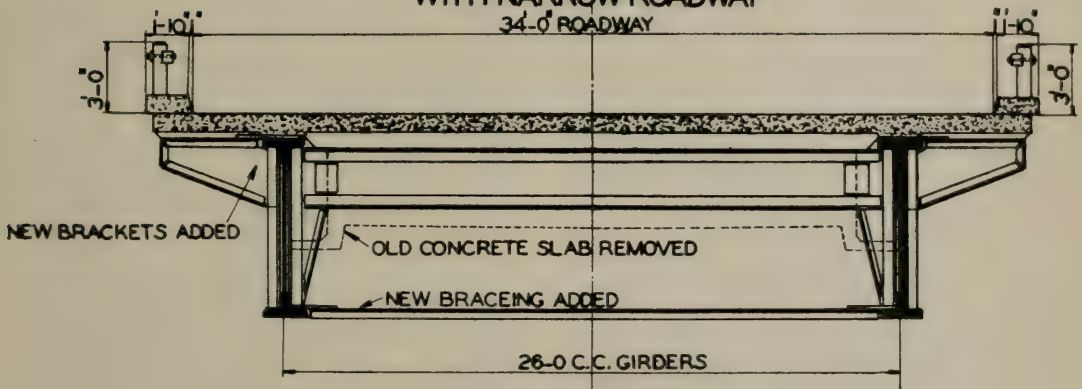
Those assigned to the design were A. B. Willett, E. H. McBroom, and M. Palmieri, with A. K. Gilbert, Resident Engineer for the State.



BEFORE TAKING the upside-down treatment, the old Castaic Creek Bridge had been relegated to the limbo of the forgotten past by the progress of road engineering. Improved alignment and grades left it an abandoned, obsolete structure with an old type 21-foot roadway.



OLD GIRDERS AT CASTAIC CREEK
WITH NARROW ROADWAY
34'-0" ROADWAY



OLD GIRDERS TURNED UPSIDE
DOWN AT LOS ALAMOS CREEK
WITH NEW WIDE ROADWAY



AFTER TAKING the surgical treatment that dismembered it and turned the 20-foot steel girders bottom-side up, behold the old bridge changed to a new one! It is now the perfectly modern structure with 34-foot roadway spanning Los Alamos Creek on the new Ridge Route alternate.

Highway Experiment Used 14 Cements

(Continued from page 4)

now manufactures eight or nine special brands. There are cements which will harden rapidly and produce concrete which it is claimed can be opened to traffic in from one to three days; other cements are designed for greater workability; less volumetric changes; lower temperature at setting; greater durability and resistance to the destructive action of sea water and other active agents; special color cements to suit the fastidious taste of the purchaser or to be used where the architectural and aesthetic requirements demand special treatment; for this purpose we have the white, grey, tan and pink cements.

Color is not of such vital importance in pavement construction as strength, durability and volumetric change characteristics.

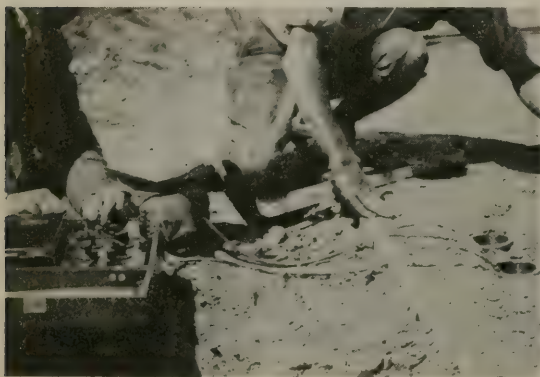
An ideal cement would be one from which concrete could be manufactured sufficiently strong to open to traffic in 24 hours and which, at the same time, would possess the greatest possible ultimate strength and durability and such low volumetric change characteristics as to cause none of the intermediate shrinkage cracks which tend to unsightliness and possible increased roughness of the pavement with age.

QUALITIES CLAIMED

Experienced engineers know that no cement so far manufactured possesses all of these characteristics, nor is there any evidence that such a cement can be made. To attain one desired result, it is usually necessary to sacrifice some other desirable quality.

The following superior qualities are claimed for some cements:

- 1—High early strength.
- 2—Strength increase over a longer period of time.
- 3—Greater ultimate strength.
- 4—More resistant to sea water.
- 5—Greater resistance to water permeability.
- 6—Resistance to acids and alkalis.
- 7—Greater plasticity and workability.
- 8—Greater sand carrying capacity.



Measuring strain and temperature with strain meters and temperature coil.



Testing beams in the field for bending strength.

- 9—More flexible in neat mortar and concrete.
- 10—Lower specific gravity.

Because there have been few, if any, practical field tests to determine the relative value of the different brands of local California cement covering all of the characteristics outlined above, and because several cement producers are manufacturing special brands of cement for which one or all of these desirable characteristics are claimed, the State Highway Commission, upon recommendation of State Highway Engineer C. H. Purcell, approved the construction of a special test section in which all of the cements on the market in the northern part of the State for which any of these characteristics were claimed could be tried out.

FOURTEEN BRANDS USED

Inasmuch as several of these qualities, such as durability and strength with age, require time for a satisfactory determination, accompanied by the fact that high early strength, durability and volumetric change characteristics are of considerable importance it was decided to make comparative tests of all brands on the market for which any special characteristics of the above nature are claimed, comparing these special brands with the standard cements from the same companies. Fourteen brands of cement were used in the test.

In order that there might be at least three check tests of each cement at each test period, both in compression and flexure, it was necessary to cast hundreds of test specimens in the field and in the laboratory during the progress of the work.

In addition to the test specimens cast during the progress of the work, cores were likewise cut from the finished pavement for the short time tests and additional cores will be cut from year to year for the long time tests.

Very complete specifications were written for the project, setting up rigid control over all features, including quality and grading of aggregate, design of mix, water control, construction operations, etc., to the end that the concrete might be cast on each section under comparable conditions, the only variable being the cement and such modifications in the

Measuring Devices Cast Into Pavement for Highway Tests

design of the mix as were necessitated by the special characteristics of the different cements.

METERS INSTALLED

Concrete specimens were cast for breaking in bending and compression at one, three, five, seven, ten and twenty-eight days. Additional specimens were cast for modulus of elasticity determination at long periods. Cores were cut for breaking to compare at all ages with the test cylinders and beams and, as previously stated, additional cores will be cut and tested whenever occasion demands in the future.

Strain meters and temperature measuring devices were cast into the pavement so that internal stress and temperature measurements could be made. The usual atmospheric temperature and humidity records were kept.

The work is in two parts of four ten-foot lanes each, or a total pavement width of forty feet. One part adjoins the city of South San Francisco on the north, and is approximately 1200 feet long. The second part is approximately one-half mile north of the first and has a length of 1000 feet.

Each portion was divided into two sections of equal length with a two-inch expansion joint between the abutting sections. The entire project was, therefore, divided into sixteen sections. As there were but fourteen brands of cement, it was possible to make a duplicate run of two of the low-temperature cements.

SECTIONS SEPARATED

The concrete in each lane has a cross-section with a nine-inch center thickness and an eleven-inch thickened edge and is separated from the concrete in the preceding lane by painting the edge of the older concrete with asphalt and grease so as to provide as complete separation as possible with minimum friction between the adjacent strips.

Bronze plugs for measuring overall expansion and contraction were set in the ends of each section.

The contract for the work was let on June 30, 1932. The contractor commenced laying concrete on August 5, 1932, and finished the last section on September 13, 1932.

The sections contained from 144 to 172 cubic yards of concrete, depending on the length. When there was no breakdown in equipment it was found possible to pour two sections per day. Construction difficulties were encountered on several days with the result that two of the sections unfortunately have an intermediate construction joint.

CURING METHODS

No reinforcing of any kind, intermediate weakened planes or expansion joints were used except the expansion joint between the abutting sections and the two unavoidable intermediate construction joints.

The high early strength cements were cured by sprinkling and covering with burlap for three days only. All other concrete was cured with earth and water for the standard period of eight days.

A complete report is now in preparation giving all details of the work. This report will be supplemented from time to time by additional data as it becomes available.

All control and test features were handled by the Materials and Research Department.

New Highway Signs Reducing Accidents By Speed Warnings

THEY can't say they didn't know the speed limit, anymore! And thus, declares E. Raymond Cato, chief of the California Highway Patrol, have the new 45-mile speed limit signs placed along the highways of the State robbed the speeding motorist of his favorite alibi.

The signs were designed by the Division of Highways and erected with the cooperation of the Automobile Club of Southern California and the California State Automobile Association. Approximately 150 were placed on the roads at locations where long, smooth stretches of highway offered the temptation to "step on her."

SIGNS SAVING LIVES

Once, says Chief Cato, when a highway patrolman arrested a speeder a frequent alibi was:

"Well I didn't know how fast you could go in this State."

But now with a speed limit sign staring him in the face every time he comes to a smooth stretch he has been compelled to fall back on all the old ones such as the aching tooth and the dead grandmother.

Moreover, the highway signs are performing a much more important function for they are saving lives by giving warning to the motorist to refrain from excessive speed.

"Our records of fatal accidents show 90 per cent of them involve speed in some way," said Cato. "It is almost axiomatic that the hazard of accident increases in the same ratio that the speed of the vehicle increases.

REPORTING "DANGER SPOTS"

"We can't keep the speeders from killing themselves. But the 45-mile speed signs help."

Members of the patrol are cooperating with the Division of Highways in locating "danger spots" along the highways that experience shows are traffic hazards.

Patrolmen have instructions to keep a record of accidents and their locations occurring on their beats. They also have instructions to report any unusual traffic hazard to the maintenance men.

THEY LAST LONGER NOW

Automobiles, like the human race, gradually are increasing their span of life, according to studies reported to the California State Automobile Association. The average life of a car is now estimated at seven years and three months, while only a few years ago the average period of usefulness was six years. Improved materials and engineering are credited with the increase.

Mistress—"Clara, give the goldfish a few more ants' eggs—it is my birthday and I want to see happy faces around me."—*Passing Show*.

"I've been terribly worried, Herbert."

"What about, dear?"

"I wonder whether I'm really the only girl whose money you've ever loved."—*National Motorist*.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 10 DECEMBER, 1932 No. 12

ROADSIDE TREES

With thousands of trees being planted in the State to enhance the beauty of the roadside and provide shade and color for the highways, it will be necessary for motorists and the public in general to aid in the protection of these if they are to reach maturity, it is pointed out by the outing bureau of the Automobile Club of Southern California.

In this connection attention is called to the wording of posters in the public parks of Spain, which apply equally well to America. These posters read as follows:

"Ye who pass by * * * and would raise your hand against me, harken ere you harm me. I am the heat of your hearth on the cold winter nights; the friendly shade screening you from the summer sun; and my fruits are refreshing draughts quenching your thirst as you journey on. I am the beam that holds your house, the board of your table, the bed on which you lie, and the lumber that builds your boat. I am the handle of your hoe, the door of your homestead, the wood of your cradle and the shell of your coffin. I am the bread of kindness and the flower of purity. Ye who pass by listen to my prayer—HARM ME NOT."

LARGE SIGNS ERECTED

That the motorist may read his direction without slackening speed by day or night, huge reflectorized signs as large as eight feet high and ten feet long are now being placed at more important intersections of State highways.

These markers, the largest in history, carry the name of one or two principal cities in either direction and an indicating arrow. The letters in white on a black background are outlined with glass reflector buttons.

Bureau Recommends Cut of Contractors' Fee for Registration

WITH a balance of \$179,319 in the State contractors' license fund anticipated at the close of the current fiscal year, a reduction in the registration fee of contractors may be sought in the 1933 Legislature.

This was indicated in a report filed with Governor James Rolph, Jr., by Col. Carlos W. Huntington, registrar of contractors and director of professional and vocational standards in the Governor's cabinet.

LIMITATIONS ASKED

The registration fee paid by contractors is \$10 annually, and the report asserted that Governor Rolph would be asked to recommend to the Legislature that the fee be set at a minimum of \$5 and a maximum of \$10. Power to set the fee, within these limitations and providing circumstances justify a reduction, would be vested in the registrar of contractors, subject to approval of the Governor and director of finance, it was announced.

The contractors' bureau has now been in operation for four years. The original fee was \$5, but this was raised to \$10 by the 1931 Legislature in order to provide the bureau with sufficient funds with which to carry on its work of protecting the public from unscrupulous contractors and at the same time raise the standards and ethics in the contracting industry, Col. Huntington said.

The report also branded reports that the fee is to be raised above the present \$10 rate as "entirely without foundation, and, in fact, gross misrepresentations."

BALANCE IN FUND

"We now have a balance of approximately \$100,000 in the contractors' license fund," Col. Huntington said, "and at the close of the fiscal year, June 30, 1933, we expect to have a balance of \$179,319, after deducting all expenditures."

"However, it is our opinion that at no time should we have a surplus of less than \$50,000. This is necessary, in accordance with sound business practices, in order to enable the registrar's office to continue to operate at all times."

"As a result of this fund balance, it is likely that we shall ask Governor Rolph to recommend a reduction in the fee to the 1933 Legislature."

November Highway Bids and Awards

EL DORADO COUNTY—About 0.4 mile to be graded and surfaced with crusher run base and bituminous treated crushed gravel or stone (road mixed). District III, Route 11, Section C. Larsen Bros., Galt, \$37,648; S. M. McGraw, Stockton, \$37,988; J. R. Reeves, Sacramento \$42,001; Bundesen & Lauritzen & Delta Dredging Co., Pittsburg, \$39,528; Clyde W. Wood, Stockton, \$42,920. Contract awarded to M. J. Bevanda, Stockton, \$36,213.

KERN COUNTY—Between Union Avenue and Oil Junction, two reinforced concrete bridges, five reinforced box culverts, and extension of one reinforced culvert. District VI, Route 4, Section G. R. H. Travers, Los Angeles, \$25,988; The Valley Constructors Inc., Modesto \$22,321; Franklin B. Gridley, Pasadena, \$22,984; Hartman Const. Co., Bakersfield, \$21,522; Fredrickson & Watson, Oakland, \$22,296; Sam Sciarrino, San Jose, \$22,648; Stroud Bros. and Seabrook, Bakersfield, \$28,970. Contract awarded to J. F. Shepherd Stockton, \$21,139.

LASSEN COUNTY—About 1.9 miles to be graded between 2.6 miles east of Susanville and Johnstownville. District II, Route 29, Section C. Harms Bros., Galt, \$10,379; California Const. Co., San Francisco, \$14,339; J. P. Brenna, Redding, \$16,861. Contract awarded to Hemstreet & Bell, Marysville, \$9,549.

LOS ANGELES COUNTY—About 12.1 miles to be paved with Portland cement concrete. District VII, Route 4, Section I. J. Basich Brothers, Torrance, \$285,288; E. H. Bashaw, Los Angeles, \$290,758; Griffith Co. Los Angeles, \$294,515; C. W. Wood Stockton, \$317,458. Contract awarded to Jahn & Bressi Construction Co., Inc., Los Angeles, \$280,169.

LOS ANGELES COUNTY—Under Culver Boulevard and Pacific Electric Railway, two structures, each having one 76-foot plate girder span with concrete deck and two 35-foot reinforced concrete approach spans, approaches to be graded and paved with asphaltic concrete. District VII, Route 60, Section C. Oberg Bros., Los Angeles, \$83,835; Herbert M. Baruch Corp., Ltd., Los Angeles, \$88,105; Lynch-Cannon Engineering Co., Los Angeles, \$83,952; Clinton Const. Co., Los Angeles, \$77,797; Robinson-Roberts Co., Los Angeles, \$85,211; Sharp & Fellows Contracting Co., Los Angeles \$84,270; Weymouth Crowell Co., Los Angeles, \$83,880; R. A. Watson, Los Angeles, \$91,407; Dimmitt & Taylor, Los Angeles, \$99,361; J. E. Haddock, Ltd., and Franklin B. Gridley, Pasadena, \$86,076. Contract awarded to Artukovich Bros., Hynes, \$71,564.

MARIN COUNTY—Between Waldo and Sausalito, 1.3 miles grading and paving with asphaltic concrete. District IV, Route 1, Section C. Union Paving Company, \$164,767; Hanrahan Company, San Francisco, \$177,678; Clark & Henery Const. Co., San Francisco, \$202,119; M. J. Bevanda, Stockton, \$239,140; Fredrickson & Watson Const. Co., Oakland, \$187,487; Clyde W. Wood, Stockton, \$197,838; A. Teichert & Son, Sacramento, \$210,721; Vincent Maggiora & Piombo Bros., San Francisco, \$206,574; MacDonald & Kahn, San Francisco \$209,427; Weymouth Crowell Co. and E. Penn Watson, Jr., Los Angeles, \$202,409; Healy-Tibbitts Co., San Francisco, \$148,175; Granfield, Farrar & Carlin, \$165,323. Contract awarded to Peninsula Paving Company, \$147,234.

SACRAMENTO COUNTY—Near North Sacramento, constructing structural steel flood gates with reinforced concrete abutments and wing walls on pile foundations. District III, Route 3, Section B. Holdener Const. Co., Sacramento, \$8,731; M. A. Jenkins, Sacramento, \$9,218; A. Frederick Anderson, Auburn, \$8,211; P. F. Bender, North Sacramento, \$9,756. Contract awarded to Lord and Bishop, Sacramento \$8,046.

SAN DIEGO COUNTY—About 4.4 miles to be graded and paved with Portland cement concrete between Alpine and Viejas Creek. District VII, Route 12, Section D. Walter Trepte, San Diego, \$101,056; Weymouth Crowell Co., and E. Penn Watson, Jr., Los Angeles, \$107,422; Sander Pearson, Santa Monica, \$104,230; Daley Corp., San Diego, \$98,658; Griffith Co., Los Angeles, \$111,103. Contract awarded to T. M. Morgan Paving Co., Los Angeles, \$94,446.

SAN DIEGO COUNTY—Bridge across Viejas Creek near Alpine consisting of ten 40-foot steel stringer spans with concrete deck on concrete bents. District VII, Route 12, Section D. Oberg Bros., Los Angeles, \$34,591; Bodenhamer Const. Co., Oakland, \$34,878; Walter Trepte San Diego, \$33,050; T. M. Morgan

Paving Co., Los Angeles \$39,955; Johnson Const. Co., Los Angeles, \$31,021; J. A. Hunt, San Diego, \$34,094; Frank Doran, San Diego, \$32,661; Lynch Cannon Engineering Co., Los Angeles \$36,507; R. H. Travers, Los Angeles, \$31,012. Contract awarded to E. O. Larsen, San Diego, \$30,191.

SAN DIEGO COUNTY—About 3.4 miles to be graded and paved with Portland cement concrete between Chocolate Creek and Alpine. District VII, Route 12, Section C. Bodenhamer Construction Co., Oakland, \$207,965; Merritt-Chapman & Scott Corporation, San Pedro, \$262,319; Walter Trepte, San Diego, \$259,845; Griffith Co., Los Angeles, \$197,935; Peninsula Paving Co., and J. P. Holland, Inc., San Francisco, \$204,613; Weymouth, Crowell Co., and E. Penn Watson, Jr., Los Angeles, \$201,289. Contract awarded to T. M. Morgan Paving Co., Los Angeles, \$184,040.

SAN LUIS OBISPO COUNTY—Bridges across Pico and Little Pico creeks; one steel stringer bridge of eight 55-foot spans, four 38-foot spans and four 20-foot spans, and one steel stringer bridge of six 48-foot spans, four 34-foot spans and two 20-foot spans. District V, Route 56, Section B. Kuckenbergh-Wittman Co., Inc., Yosemite, \$99,609; Oberg Bros., Los Angeles, \$99,649; Hartman Const. Co., and G. A. Graham, Bakersfield, \$93,322; Rocca and Caletti, San Rafael, \$90,191; J. F. Shepherd, Stockton, \$94,689; M. B. McGowan, Inc., San Francisco, \$91,684; Theo. M. Maino, San Luis Obispo, \$95,372; Herbert M. Baruch Corp., Ltd., and Robinson-Roberts Co., Los Angeles, \$91,447. Contract awarded to Carl N. Swenson Co., San Jose, \$84,295.

SANTA CLARA COUNTY—About 4.7 miles to be graded and paved with Portland cement concrete between Oregon Avenue and Whisman Road. District IV, Route 68, Section A. D. McDonald and N. M. Ball, Sacramento, \$387,367; Clyde W. Wood, Stockton, \$330,752; Fredrickson & Watson Construction Company and Fredrickson Bros., Oakland, \$362,760; Union Paving Co., San Francisco, \$357,239; M. J. Bevanda, Stockton, \$413,388; Peninsula Paving Co., \$353,825; Hanrahan Co., San Francisco, \$342,758. Contract awarded to Basich Brothers, Torrance, \$328,956.

SANTA CLARA COUNTY—About 3.5 miles to be graded and paved with Portland cement concrete between Whisman Road and Lawrence Station Road. District IV, Route 68, Section A. B. Fredrickson & Watson Const. Co., and Fredrickson Bros., Oakland, \$195,830; M. J. Bevanda, Stockton, \$213,252; Clyde W. Wood, Stockton, \$197,414; Peninsula Paving Co., San Francisco, \$199,375. Contract awarded to Basich Bros. Torrance, \$181,271.

SHASTA COUNTY—About 0.6 miles grading at westerly city limits of Redding. District II, Route 20, Section B. Hemstreet & Bell, Marysville, \$13,312; S. M. McGaw, Stockton, \$15,571. Contract awarded to M. A. Purdy, San Francisco, \$11,668.

STANISLAUS COUNTY—Bridge across Tuolumne River near Modesto, consisting of three 80-foot deck plate girder spans, one 55-foot 6-inch steel stringer span, thirty-nine 44-foot steel stringer spans and one 36-foot 2-inch steel stringer span on concrete bents with pile foundations. District X, Route 4, Section B. M. B. McGowan, Inc., San Francisco, \$234,981; Mercer-Fraser Co., Eureka, \$242,306; Oberg Bros. Los Angeles, \$268,407; Sharp & Fellows Contracting Co., Los Angeles, \$238,533; Healy-Tibbitts Construction Co., San Francisco, \$242,211; Mitty Bros. Construction Co., Los Angeles, \$237,977; Rocca and Caletti, San Rafael, \$230,655; Ward Engineering Co., San Francisco, \$256,062; MacDonald & Kahn Co., Ltd., San Francisco, \$259,520; Hartman Construction Co., & G. A. Graham, Bakersfield, \$234,275; Herbert M. Baruch Corporation, Ltd., and Robinson-Roberts Co., Los Angeles, \$240,560; Bodenhamer Construction Co., Oakland, \$244,959; Peninsula Paving Co. San Francisco, \$241,193; George Pollock Co., Sacramento, \$248,439; Lord & Bishop, Sacramento, \$255,171. Contract awarded to J. F. Knapp, Oakland, \$229,960.

VENTURA COUNTY—About 10.9 miles to be paved with Portland cement concrete between Hueneme Road and Little Sycamore Creek. District VII, Route 60, Section A. United Concrete Pipe Corp., Los Angeles, \$127,127; Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland, \$143,799; J. E. Haddock, Ltd., Pasadena, \$125,442; Griffith Co., Los Angeles, \$121,498; Kovacevich & Price, Inc., South Gate, \$123,320; Oswald Bros., Los Angeles, \$139,677.

Mint Canyon Realignment Planned

(Continued from page 18)

approach to the city of Modesto. Bids were opened on October 26th for the construction of a new bridge across the Tuolumne River at Modesto and the present road improvement involves the construction of the State highway on an improved alignment which will connect with the existing highway on the easterly side of the railroad at Hatch crossing and enter the city over the new bridge at Ninth Street.

This new alignment will eliminate from the State routing two grade crossings over the main line of the Southern Pacific Railroad and several dangerous right angle turns. It marks another step towards the complete modernization of this main artery of the State highway system. The new road will be constructed to a roadway width of 46 feet and the Portland cement concrete pavement will be 30 feet wide.

Two highway improvement projects are proposed for the State highway which connects southern California with Reno via the Owens Valley. The one project involves the construction of a graded roadbed 24 feet wide and placing a bituminous treated crushed rock surfacing 20 feet wide and crusher run base from Whiskey Creek to Convict Creek between Bishop and Bridgeport in Mono County.

The second project consists of reconstructing the graded roadbed and placing an oil treated selected material surfacing 24 feet wide from one-half mile south of Keough's Hot Springs to one mile south of Bishop. These two construction projects will be decided improvements to this important highway leading to the "East of the Sierra" section of California.

BAD CURVES DOOMED

A project of interest to southern California motorists is the proposed improvement to the worst section of the existing State highway through Mint Canyon between Saugus and Palmdale in Los Angeles County. The section to be covered by this project is the mile and a half between the Oaks and Vasquez Rock road.

It is here that the notorious "Seven Sisters" curves have for long been a hazard to traffic traveling this road from Los Angeles to Mojave. The work will involve complete revision of alignment and grade and the construction of a 40-foot graded roadbed and modern Portland cement concrete pavement 20 feet wide. The project marks the first step in the reconstruction of the State highway through the entire length of Mint Canyon.

On the Mojave-Barstow lateral a new bridge is to be constructed at the westerly entrance of Barstow across the Mojave River. This structure will be a 745-foot deck plate girder and steel stringer bridge on concrete piers and abutments with a concrete deck providing a clear roadway 24 feet wide and two 3-foot sidewalks. This improvement to this desert highway will replace the old steel truss and timber trestle with its narrow 17-foot roadway which has served traffic since the days when the old 20-mule freighters trudged along the sandy ways of the great Mojave Desert.

CONNECTS RIDGE ALTERNATE

In Los Angeles County complete reconstruction of the northerly section of the Ridge Route is to be

GASOLINE TAX DECREASE DUE TO 1,000,000 CAR SHORTAGE

Early returns indicate that income from motor taxes will be reduced for the first time since the highway transportation industry swung into full stride, says a report from an authoritative source. The statement continues:

"A decrease in both license fee and gasoline tax income is anticipated because of economic pressure which has materially curtailed car sales.

"While the total 1932 automobile registrations will not be known until early next year, evidence shows that there will be 1,000,000 fewer cars than in 1931, or a total of 25,000,000. The reduced registration will account for a loss of some \$14,000,000 in license fee income to the States.

"This drop in registration is resulting in lessened gasoline consumption, although such was not the case in 1931 when car sales fell nearly 3 per cent while gasoline usage increased by more than 5 per cent. The disappearance of 1,000,000 cars from the roads can be expected to bring a reduction of nearly 500,000,000 gallons in gasoline consumption.

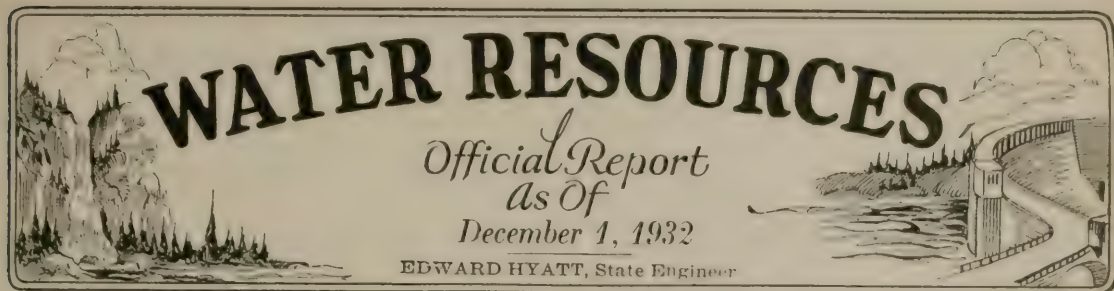
"A serious problem, therefore, confronts State highway departments faced with lowered motor tax incomes."

TOPOGRAPHIC SHEETS COMPLETED FOR TWO MALIBU QUADRANGLES

The final lithographed sheets of the Dume Point and Solstice Canyon quadrangles in the Malibu area of western Los Angeles County are now available. These quadrangles were surveyed in 1929 by the U. S. Geological Survey in cooperation with Los Angeles County. The sheets are published on a scale of 1:24000 with contour intervals of 25 feet.

undertaken between Gorman and the Kern County line. By this improvement the alignment and grade throughout the entire 3.8 miles of the project will be revised to meet the requirements of present day standards of arterial highway construction. The new roadbed will be 46 feet wide and the pavement will be Portland cement concrete 30 feet wide. This project will connect with the northerly end of the 30-foot pavement now being placed on the Ridge Route Alternate and will carry the same high standards of highway construction to the Kern County line.

Between the new Santa Clara River bridge and the city of Ventura it is proposed to widen the existing 20-foot Portland cement concrete pavement to 30 feet. This improvement to the Coast Route in this section of southern California will connect with the proposed new routing of the State highway through the city of Ventura which is to be constructed cooperatively by the city and State this year.



The employment of 570 men as day laborers in clearing operations on the Sacramento Flood Control and Reclamation projects and an additional 650 men in similar work on the overflow area of the Feather River was a contribution to unemployment relief in November reported by State Engineer Edward Hyatt in his statement of the activities of the Division of Water Resources for that month. Increased flowage of the Sacramento and San Joaquin rivers, completion of preliminary work for snow surveys, details of dam improvements and water applications are other matters covered in the report as follows:

An investigation and report of findings was made to the Superior Court of Riverside County by the State Engineer in connection with proceedings for the dissolution of the Ladera Irrigation District of that county.

An inspection was made of the construction work proposed by the La Mesa, Lemon Grove and Spring Valley Irrigation District, San Diego County. This work consists of the replacing with pipe lines of 17½ miles of the Cuyamaca flume, at a cost of \$500,000. This flume has been in use since 1888 and is the main transmission line of the district from its diversion dam on the San Diego River.

For the purpose of conference or investigation the following districts were visited: Hemet Irrigation District, Riverside County; Terra Bella Irrigation District, Tulare County; Oakdale Irrigation District, Stanislaus County; and Merced Irrigation District, Merced County.

DISTRICTS SECURITIES COMMISSION

Meetings of the Commission were held on October 21 and 31. Both meetings were given mostly to the receiving of progress reports on and to the discussion of the refinancing plans of several irrigation districts which have advanced refunding proposals.

The following matters were approved by the Commission:

Lindsay-Strathmore Irrigation District—Purchase of 222 shares of the Consolidated Peoples Ditch Company for \$10,740.

Corcoran Irrigation District—Purchase of one share of Peoples Ditch Company for \$10,000.

La Mesa, Lemon Grove and Spring Valley Irrigation District—Plan to use \$500,000 of its unsold bonds for replacing 17½ miles of Cuyamaca flume with concrete and steel pipe lines.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project

A force of 80 men has been continuously engaged in the clearing operations in the Sutter and Tisdale by-passes, the laborers working on a five-day shift basis at \$4 per day. This involves a labor turnover of about 125 men per week.

The canals of the drainage system are being cleaned by the removal of tule, grass and brush by hand labor with a crew of eight men. Incidental work on the pumping plants and miscellaneous structures to prepare them for the winter season has been continued with a force of five men.

Sacramento Flood Control Project—Bank Protection

The California Debris Commission is now actively at work on several units of the program for permanent bank protection in cooperation with the State, namely, at Chicory Bend, Russell Bend and the Rosebury ranch, on the Sacramento River.

Arrangements have been made for a small repair job to the revetment at Oak Hall Bend in cooperation with Reclamation District No. 537, involving the placement of approximately 70 tons of rock.

Sacramento Flood Control Project—Construction

Reports have been rendered on several applications before the Reclamation Board and work done under various applications has been inspected.

Clearing construction in the American River By-pass in connection with the construction of the North Sacramento flood control project was commenced on September 26th and completed on November 1st, at a cost of \$10,000. The area cleared was approximately 116 acres. About 450 men were employed in all on this work.

On November 3d construction clearing was commenced in the overflow area of the Feather River on the east side between Bear River and Starr Bend, with a force of 60 men. This force will be increased to 80 men on November 19th. The Reclamation Board on November 16th made available \$8,000 additional for this work, making \$14,000 in all. The men are employed for five-day shifts at \$4 per day, and this work will make it possible to give employment to about 650 men.

Russian River Jetty

A crew of 11 men has been engaged in quarrying and placing rock in the jetty. This will continue until about December 10th, when the available funds will be exhausted.

Irrigation Field Work Completed

(Continued from page 29)

Flood Measurements and Gages

The annual servicing of all gaging stations maintained by this Division, to be operated during the flood season, is now in progress. In the office the collection of data for the past seasons, from 1914 to date, has been completed and reports have been prepared.

WATER RIGHTS

Applications to Appropriate

Twenty applications to appropriate water were received during the month of October; sixteen were denied; eighteen were approved and three passed to license.

Among the applications received were two of considerable magnitude for mining purposes; one by C. H. Munro, Hobart Building, San Francisco, seeking to appropriate 200 cubic feet per second from Deer Creek, a tributary of Yuba River, to be used in the vicinity of Smartsville, and the other by H. G. Stibbs, Trustee, 234 Holbrook Building, San Francisco, seeking to appropriate 250 cubic feet per second from tributaries of the Middle Fork of American River.

Among the more important permits issued were one to the Oswald Water District allowing the diversion of 10 cubic feet per second from Feather River for the irrigation of 832.42 acres in Sutter County and one to the North Fork Ditch Company of Sacramento, allowing the diversion of 35 cubic feet per second from North Fork of American River for the irrigation of 7020 acres in Sacramento County at an estimated cost of \$50,000.

Inspection of projects under permit for the field season of 1932 was completed during October. A total of 195 projects were inspected and reports of the investigations will be prepared.

Notices to 1257 permittees went forward on October 1st requesting reports of progress and 520 responses were received during the month. These are in process of study and will form the basis for appropriate action in the way of extensions, or listing for permit inspection.

ADJUDICATIONS

Shasta River (Siskiyou County). Case pending in the Superior Court of Siskiyou County awaiting entry of the judgment and decree which is being prepared by the Division at the request of the court.

Whitewater River (San Bernardino and Riverside counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

Clover Creek (Shasta County). The Clover Creek case is pending in the Superior Court of Shasta County awaiting the court's pleasure in setting a date for hearing.

Butte Creek (Siskiyou County). Case pending in

the Superior Court of Siskiyou County awaiting action by the parties involved.

Eagle Creek (Modoc County). The report covering the distribution of the waters of Eagle Creek in accordance with the trial schedule of allotments adopted for the 1932 season is 50 per cent completed.

South Fork Pit River (Modoc County). The report covering the field work on the investigation of the water supply and use of water on the South Fork Pit River is 25 per cent completed.

Hat Creek (Shasta County). A stipulation for judgment has been prepared by the Division and submitted to counsel for their approval.

Deep Creek, Franklin Creek, Cottonwood Creek and Pine Creek in Surprise Valley (Modoc County). Reports on these court reference cases will be prepared following completion of the Eagle Creek and South Fork of Pit River reports.

Little Shasta River and Lower Shasta River (Siskiyou County). Reports covering water master service on these streams for the 1932 season have been completed.

Pit River in Big Valley (Modoc and Lassen counties). The report covering supervision of diversions from Pit River in Big Valley for the 1932 season is 50 per cent completed.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The field work for the 1932 irrigation season, including measurements of all diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory, was completed during the past month, except for the maintenance of the permanent salinity stations and the eight Delta tide gages. Office work is now in progress in computing the diversions and compiling all data for the 1932 report. The Sacramento River at Sacramento is now flowing about 4200 second-feet and due chiefly to increased power releases on the Tuolumne River the flow of the San Joaquin River near Vernalis has increased to 2200 second-feet. With but little change during the past month in the flow reaching the Delta, the salinity conditions have remained practically constant with the 100-part line near the point of Sherman Island. In the following tabulation the salinity on November 6, 1932, at some of the Delta stations is compared to the corresponding salinity on November 6, 1931.

Station—	Salinity in parts of chlorine per 100,000 parts of water	
	11/6/32	11/6/31
Point Orient.....	1660	1755
Point Davis.....	1240	1490
Bullshead.....	960	1300
Bay Point.....	760	1095
Collinsville.....	350	510
Emmaton.....	40	253
Three Mile Slough Bridge.....	42	202
Rio Vista.....	3	128
Antioch.....	230	485

All Ready for 1933 Snow Surveys

(Continued from preceding page)

Station—	Salinity in parts of chlorine per 100,000 parts of water	
	11/6/32	11/6/31
Jersey-----	30	360
Central Landing-----	4	71
Middle River P. O.-----	8	205

CALIFORNIA COOPERATIVE SNOW SURVEYS

With the completion of a trip to stock shelter cabins and make final arrangements for surveys in the Mokelumne-Carson basins, all field work in readiness for the snow surveys in the spring of 1933 has been completed. Until time for the first surveys at key snow courses at the end of January, work on this project is now in the office computing the 1931-32 natural flow at the various stream gaging stations. The data on the measured flow at these stations are just becoming available since the close of the water year on September 30th. These computations of the natural flow for the seasonal and the April-July run-off furnish a check on the forecasts made on April 1st based on the snow surveys. Other office work includes routine maintenance to date of precipitation tabulations, etc.

DAMS

To date 816 applications have been received for approval of dams built prior to August 14, 1929; 105 for approval of plans for construction or enlargement and 373 for approval of plans for repair or alteration.

Fifteen dams are under construction and 150 dams are under repair.

Applications for Approval of Plans for Construction or Enlargement of Dams

Dam	Owner	County
Devils Canyon Dyke No. 1	City of San Bernardino	San Bernardino
Devils Canyon Dyke No. 2	City of San Bernardino	San Bernardino
Devils Canyon Dyke No. 3	City of San Bernardino	San Bernardino
Ditch Creek Crib	Heiser Crusade Placers, Ltd.	Tehama
Desilting Basin No. 3	Cucamonga Basin Protective Assoc.	San Bernardino
Dry Canyon *	City of Los Angeles	Los Angeles

* Enlargement

The Devils Canyon dams are to be built jointly by the city, county and State for the purpose of diverting and spreading the flood waters of Devils Canyon and allowing them to sink into the gravels of Devils Canyon Cone.

The Ditch Creek Crib Dam is to store debris from proposed mining operations on Ditch Creek, a tributary of Deer Creek.

Desilting Basin No. 3, to be built by the Cucamonga Basin Protective Association, is to be for the same purpose as those at Devils Canyon. It will spread the flood waters of Cucamonga Creek.

The city of Los Angeles plans to raise their Dry Canyon Dam five feet, thereby increasing the storage

capacity by 143 acre-feet. This dam is located in Dry Canyon, tributary to the Santa Clara River, and is for storage and equalization purposes for municipal, domestic, irrigation and power uses.

Applications Received for Approval of Plans for Repair or Alteration of Dam

Dam	Owner	County
Morning Star	McGeachin Placer Gold Mining Co.	Placer
Buena Vista	Kern Co. Land Co. and Buena Vista Assoc.	Kern
Malibu	Marblehead Land Company	Los Angeles
Combie	Nevada Irrigation District	Placer-Nevada
Seiad Valley	H. H. Schmitt	Lassen
Slate Creek	H. H. Schmitt	Lassen
Sharp Park	City and County of San Francisco	San Mateo

Plans Approved for Construction

Dam	Owner	County
Devils Canyon Dyke No. 1	City of San Bernardino	San Bernardino
Devils Canyon Dyke No. 2	City of San Bernardino	San Bernardino
Devils Canyon Dyke No. 3	City of San Bernardino	San Bernardino
Desilting Basin No. 3	Cucamonga Basin Protective Assn.	San Bernardino

Plans Approved for Repairs or Alterations

Dam	Owner	County
Upper San Leandro	East Bay Municipal Utility Dist.	Alameda
Morning Star	McGeachin Placer Gold Mining Co.	Placer
Hole	W. J. Hole	Riverside
Buena Vista Waste Weir	Kern Co. Land Co. and Buena Vista Assoc.	Kern
Combie	Nevada Irrigation District	Placer-Nevada
Malibu	Marblehead Land Company	Los Angeles
Seiad Valley	H. H. Schmitt	Lassen
Slate Creek	H. H. Schmitt	Lassen
Sierra Madre	Los Angeles Co. Flood Control Dist.	Los Angeles

WATER RESOURCES

Pit River Investigation (Modoc and Lassen Counties)

Work on the report covering the three years' investigation was continued during the month. Studies of various storage possibilities have been completed and the text of the report is in course of preparation.

Salinas Valley, Mojave River, Ventura County and South Coastal Basin Investigations

Progress is being made on these investigations and they have proceeded along routine lines during the present month.

STATE WATER PLAN

The Board of Engineers for Rivers and Harbors of the United States War Department has just completed a ten-day investigation of the Great Central Valley Project of the State's Water Plan. This investigation started at Bakersfield on November 9th with a trip of inspection throughout the Sacramento and San Joaquin valleys to Kennett dam site on the Sacramento River. At the conclusion of the trip of inspection, a public

(Continued on page 39)

Metal Crib Walls Installed as an Experiment on Big Oak Flat Road

By CLARENCE E. BOVEY, Maintenance Engineer, District X

MODERN metal crib wall construction, the first of its type in California, has brought to an end a serious hazard which existed for years at a point 14 miles above Groveland on the Big Oak Flat Road to Yosemite National Park. At this point route 40 of the California State Highway system passes above the tracks of the Hetch-Hetchy spur of the Yosemite Railroad, being cut in on the steep hillside and located horizontally not more than 20 feet from the railroad tracks. Since the highway is also approximately 20 feet above the railway a rock wall was required to prevent slides and washouts from depositing upon the tracks.

However, the storms of every year brought down much debris and frequently washed out portions of the rock wall creating an almost continuous expense for slide removal and prevention. The storms of the winter of 1931-1932 determined that a more stable wall than a rock wall was required at the location and after a careful study of the situation, it was determined that a crib wall should be constructed.

METAL CRIBBING CHOSEN

A careful estimate was made of concrete cribbing and of wood cribbing and of the relative ease of transportation and installation, and it was found advisable to make an experimental installation of a new metal cribbing manufactured of iron, which had recently been brought to the coast. It was quite apparent that such a cribbing would have great strength and durability and that unlike solid cribbing it would have a marked degree of flexibility due to its interlocking construction.

It was very desirable that both the highway and the railroad track be kept open for traffic during the installation of these walls, and because of the ease and speed with which a metal crib wall may be erected, this type of construction was deemed very suitable.

The site of installation being approximately 30 miles from Chinese Camp, the nearest public railroad siding, it was necessary to haul

the cribbing from that point in trucks. The economies in transporting this material were well demonstrated in that because of its weight it required only about six truck loads to deliver the material to the site, whereas, it was estimated, about 30 loads would have been necessary with the other types.

SUBSTANTIAL SAVING

There was also a substantial saving in the time required for loading and unloading of this material. It required only two men to load and unload these light units, none of which weigh more than 50 pounds.

This job was located below the highway level, making it necessary to lower the units in some manner. Cranes are usually required for this operation, but in this instance no such equipment was necessary. To deliver the crib units to the lower level, a wooden chute was constructed and one man was able to slide the sections down to the crew without fear of damage or breakage. Carrying the units from the chute to their proper place took but little time since a man can easily carry two units at a time.

These metal units are made of a special iron, similar to culverts bearing the same brand, and are protected with a standard coat of galvanizing. All units are uniform; this insures perfect bearing, eliminating the use of shims. Expansion joints are provided for and interlocking is accomplished by means of bolts and other simple devices.

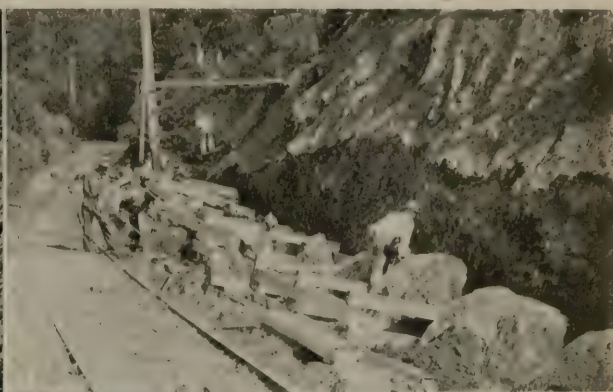
MANY ADVANTAGES

The units are so designed as to permit stepping up or down to meet highway or slope elevations and are designed to withstand a 30-ton compression load.

It is believed that this form of cribbing also has a definite advantage in its ability to withstand extreme temperature changes and moderate fill settlement without damage.

The finished walls in this location were installed by common labor under the supervision of an experienced cribbing man. A minimum of excavation was required. The units were installed and locked together with ease, and the finished job is very pleasing to the eye.

Property of
Seattle Public Library



IN THE CRIB lies the secret of the successful termination of slide removal grief and expense on the Big Oak Flat road where the 20-foot embankment of the State highway borders the Hetch Hetchy spur of the Yosemite Railroad. No. 1 shows the economical method of excavation employed in installation, made possible by the sectional construction of the crib wall units. No. 2 is a picture of the steep embankment topped by the highway guard rail, taken before the improvement. No. 4 shows a section of the completed metal crib retaining wall before the fill material had been entirely

placed. No. 3 is a close-up view of a unit of metal cribbing showing the detail of interlocking construction. No traffic delay was caused to the railroad or any interference with the free passage of trains during the metal crib installation. No. 5 shows a motor engine hauling cars heavily laden with big projecting logs passing with plenty of clearance while crib installation was in progress.

Vital Statistics on Dam Construction

APPLICATIONS FILED

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources during the month of November, 1932.

TULARE COUNTY—Elk Bayou Dam No. 711. Elk Bayou Ditch Company, Tulare, owner; buttress, 25 feet above streambed with a storage capacity of 60 acre-feet, situated on Elk Bayou tributary to Kaweah in Sec. 36, T. 20 S., R. 24 E., M. D. B. and M., for diversion purposes for irrigation use.

SAN MATEO COUNTY—Sharp Park Dam No. 10-20. City and County of San Francisco, owner; earth, 20 feet above streambed with a storage capacity of 15 acre-feet, situated on Salt Creek in Sec. 36, T. 3 S., R. 6 W., M. D. B. and M.

Applications for approval of plans and specifications for construction or enlargement of dams filed with the State Department of Public Works, Division of Water Resources, during the month of November, 1932.

SANTA CLARA COUNTY—Grant Co. Lake Dam No. 621-2. J. D. Grant Co., San Francisco, owner; earth, 24 feet above streambed with a storage capacity of 700 acre-feet, situated on Arroyo Aguague tributary to Penetencia Creek in Sec. 12, T. 7 S., R. 2 E., M. D. B. and M., for storage purposes for irrigation use. Estimated cost of enlargement \$2,500; fee paid \$25.

MODOC COUNTY—Payne Dam No. 143. Frank McArthur, Alturas, owner; earth, 9 feet above streambed with a storage capacity of 2849 acre-feet, situated on Payne Creek tributary to Pit River in Sec. 16, T. 41 N., R. 14 W., M. D. B. and M. For storage purposes for irrigation use. Estimated cost \$2,000; fee paid \$20.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources, during the month of November, 1932.

SAN MATEO COUNTY—Sharp Park Dam No. 10-20. City and County of San Francisco, San Francisco, owner; earth, situated on Salt Creek in Sec. 36, T. 3 S., R. 6 W., M. D. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of November, 1932.

SAN BERNARDINO COUNTY—Devils Canyon Dyke No. 1, 17-2. City of San Bernardino, San Bernardino, owner; earth, 3 feet above streambed with a storage capacity of 58 acre-feet, situated on Devils Canyon Cone tributary to Santa Ana River in Sec. 7, T. 1 N., R. 4 W., S. B. B. and M. For storage and diversion purposes.

SAN BERNARDINO COUNTY—Devils Canyon Dyke No. 2, 17-3. City of San Bernardino, San Bernardino, owner; earth, 3 feet above streambed with a storage capacity of 27 acre-feet, situated on Devils Canyon Cone tributary to Santa Ana River in Sec. 7, T. 1 N., R. 4 W., S. B. B. and M. For storage and diversion purposes.

SAN BERNARDINO COUNTY—Devils Canyon Dyke No. 3, 17-4. City of San Bernardino, San Bernardino, owner; earth, 3 feet above streambed with a storage capacity of 16 acre-feet, situated on Devils Canyon Cone tributary to Santa Ana River in Sec. 6, T. 1 N., R. 4 W., S. B. B. and M. For storage purposes and also diversion.

SAN BERNARDINO COUNTY—Desilting Basin No. 3-76. Cucamonga Basin Protective Association, Cucamonga, owner; earth, 22 feet above streambed with a storage capacity of 80 acre-feet, situated on Cucamonga Creek tributary to Santa Ana River in Sec. 29, T. 1 N., R. 7 W., S. B. B. and M. For storage purposes, for domestic and irrigation use.

EL DORADO COUNTY—Williamson Dam No. 464. Hector Williamson, Placerville, owner; earth, 41 feet

above streambed with a storage capacity of 200 acre-feet, situated on a creek tributary to Webber Creek in Sec. 35, T. 11 N., R. 9 E., M. D. B. and M. For storage purposes for irrigation and recreation use.

LOS ANGELES COUNTY—Dry Canyon Dam No. 6-5. City of Los Angeles, Los Angeles, owner; earth, 59½ feet above streambed with a storage capacity of 800 acre-feet, situated on Dry Canyon Creek tributary to Santa Clara River in Sec. 35, T. 5 N., R. 16 W., S. B. B. and M. For storage purposes for municipal, domestic and irrigation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of November, 1932.

PLACER COUNTY—Morning Star Dam No. 325. McGeachin Placer Gold Mining Company, Sacramento, owner; earth, situated on Shirltail Creek tributary to American River in Sec. 17, T. 15 N., R. 11 E., M. D. B. and M.

RIVERSIDE COUNTY—Hole Dam No. 813. W. J. Hole, Arlington, owner; earth, situated on Arroya tributary to Santa Ana River in Sec. 36, T. 2 S., R. 6 W., S. B. B. and M.

KERN COUNTY—Buena Vista (Kern R. Waste Weir) No. 732. Kern County Land Company and Buena Vista Associate, Bakersfield and San Francisco, owners; concrete and flashboards, situated on Kern River in Sec. 32, T. 30 S., R. 25 E., M. D. B. and M.

PLACER AND NEVADA COUNTIES. Combie Dam No. 61-9. Nevada Irrigation District, Grass Valley, owner; situated on Bear River tributary to Yuba River in Sec. 2, T. 13 N., R. 8 E., M. D. B. and M.

LOS ANGELES COUNTY—Malibu Dam No. 773. Marblehead Land Company, Los Angeles, owner; arch, situated on Malibu Creek in Sec. 19, T. 1 S., R. 17 W., S. B. B. and M.

LASSEN COUNTY—Said Valley Dam No. 250. H. H. Schmitt, Susanville, owner; earth, situated on unnamed drainage tributary to Grasshopper Valley in Sec. 31, T. 36 N., R. 11 E., M. D. B. and M.

LASSEN COUNTY—Slate Creek Dam No. 250-3. H. H. Schmitt, Susanville, owner; earth, situated on unnamed drainage tributary to Slate Creek in Sec. 1, T. 34 N., R. 10 E., M. D. B. and M.

LOS ANGELES COUNTY—Sierra Madre Dam No. 32-13. Los Angeles County Flood Control District, Los Angeles, owner; arch, situated on Little Santa Anita River tributary to Big Santa Anita River in Sec. 16, T. 1 N., R. 11 W., S. B. B. and M.

SAN MATEO COUNTY—Sharp Park Dam No. 10-20. City and County of San Francisco, San Francisco, owner; earth, situated on Salt Creek in Sec. 36, T. 3 S., R. 6 W., M. D. B. and M.

MONO COUNTY—Lower Twin Lakes Dam No. 531-2. S. H. Hunewill, W. F. Dressler, F. W. Simpson, Bridgeport, owners; rockfill, situated on Robinson Creek tributary to East Walker River in Sec. 33, T. 4 N., R. 24 E., M. D. B. and M.

Nearly twenty-seven per cent of drivers involved in fatal accidents last year and twenty-four per cent of those in nonfatal accidents were under twenty-five years old.

"Are you sure this is the man who stole your car?"

"I was until your cross-examination. Now I don't know if I ever possessed a car."—*Georgia Highways*.

A little city boy was visiting his country cousin.

"What do you know about cows?" quizzed the country lad. "You don't even know if that's a Jersey cow."

"I don't know from here, 'cause I can't see its license."—*Motor Land*.

Water Applications and Permits

APPLICATIONS FILED

Applications for permit to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of November, 1932.

DEL NORTE COUNTY—Application 7417. F. C. Foote, 2149 W. 80th Street, Los Angeles, for 50 c.f.s. from Craig's Creek tributary to Smith River to be diverted in Sec. 36, T. 17 N., R. 2 E., H. B. and M. For mining and domestic purposes. Estimated cost \$20,000.

TUOLUMNE COUNTY—Application 7418. L. L. Stayton, Ida Henry, John A. Russi, Joe Shaska and Geo. Bowen, c/o L. L. Stayton, Columbia, for 3 miners' inches from Deadman Creek tributary to Rose Creek; thence Stanislaus River to be diverted in Sec. 30, T. 3 N., R. 15 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$500.

HUMBOLDT COUNTY—Application 7419. W. V. Hunt, c/o Arthur W. Hill, attorney, Eureka, for 30 c.f.s. from Mad River tributary to Pacific Ocean to be diverted in Sec. 16, T. 6 N., R. 1 E., H. B. and M. For irrigation and domestic purposes (65 acres). Estimated cost \$2,500.

TRINITY COUNTY—Application 7420. Norris R. Ferguson, Junction City, for 0.1 c.f.s. from unnamed stream tributary to Canyon Creek; thence Trinity River to be diverted in Sec. 36, T. 34 N., R. 11 W., M. D. B. and M. For irrigation and domestic purposes. Estimated cost \$200.

EL DORADO COUNTY—Application 7421. C. M. Carter, R. D. Nicol and W. P. Austin, 1733 Jefferson Street, Oakland, for 614,000 acre-feet per annum from South Fork American River tributary to American River to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For irrigation purposes (450,000 acres). Estimated cost \$9,000,000.

EL DORADO COUNTY—Application 7422. C. M. Carter, R. D. Nicol and W. P. Austin, 1733 Jefferson Street, Oakland, for 100,000 acre-feet per annum from South Fork American River tributary to American River to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For municipal purposes. Estimated cost \$9,000,000.

SISKIYOU COUNTY—Application 7423. Horace A. Cook, Happy Camp, for 3 c.f.s. from Twin Gulch tributary to Indian Creek; thence Klamath River to be diverted in Sec. 22, T. 17 N., R. 7 E., H. B. and M. For mining purposes. Estimated cost \$500.

TRINITY COUNTY—Application 7424. W. J. Gear, Hayfork, for 3 c.f.s. from Bear Creek tributary to Hayfork of Trinity River to be diverted in Sec. 28, T. 3 N., R. 8 E., H. B. and M. For mining purposes.

TRINITY COUNTY—Application 7425. W. J. Gear, Hayfork, for 3 c.f.s. from Jud Creek tributary to Hayfork of Trinity River to be diverted in Sec. 33, T. 3 N., R. 8 E., H. B. and M. For mining purposes.

EL DORADO COUNTY—Application 7426. B. W. Stone, 161 Ellis Street, San Francisco, for 500 c.f.s. and 125,000 acre-feet per annum from Rubicon River, Pilot Creek, Gerle Creek, Loon Lake, Buck Island Lake, Rockbound Lake, Little South Fork of Rubicon River, tributary to American River drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E., in Sec. 11, T. 12 N., R. 12 E., in Sec. 24, T. 13 N., R. 13 E., in Secs. 11, 31, and 34, T. 14 N., R. 14 E., in Sec. 4, T. 13 N., R. 15 E., in Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

EL DORADO COUNTY—Application 7427. Mr. John Davidson, agent, c/o Wm. M. Kearney, attorney, Reno, Nev., for 600 acre-feet per annum from Star Lake tributary to Cold Creek to be diverted in Sec. 30, T. 12 N., R. 19 E., M. D. B. and M. For irrigation purposes (1400 acres). Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Application 7428. L. M. Bailey, Vidal, for 1 c.f.s. from underground flow of Big Dry Dunkirk Wash tributary to Colorado River drainage area to be diverted in Sec. 24, T. 2 N., R. 23 E., S. B. B. and M. For mining and domestic purposes. Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Application 7429. L. M. Bailey, Vidal, for 2 c.f.s. from underground flow in Big Dry Dunkirk Wash tributary to Colorado River drainage area to be diverted in Sec. 24, T. 2 N., R. 23 E., S. B. B. and M. For industrial and domestic purposes. Estimated cost \$3,000.

MARIPOSA COUNTY—Application 7430. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, for 3 gallons per minute from unnamed spring tributary to Merced River to be diverted in Sec. 2, T. 4 S., R. 18 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$25.

FRESNO COUNTY—Application 7431. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, for 5 gallons per minute from unnamed spring in Indian Basin tributary to Indian Creek to be diverted in Sec. 9, T. 13 S., R. 28 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$50.

FRESNO COUNTY—Application 7432. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, for 5 gallons per minute from spring 1, for 20 gallons per minute from spring 2, for 5 gallons per minute from spring 3, total 30 gallons per minute from group of 3 unnamed springs tributary to Indian Creek to be diverted in Sec. 10, T. 13 S., R. 28 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$100.

FRESNO COUNTY—Application 7433. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, Cal., for 5 gallons per minute from unnamed spring in Indian Basin tributary to Indian Creek to be diverted in Sec. 10, T. 13 S., R. 28 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$50.

FRESNO COUNTY—Application 7434. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, Cal., for 10 gallons per minute from unnamed spring in Indian Basin tributary to Indian Creek to be diverted in Sec. 3, T. 13 S., R. 28 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$175.

FRESNO COUNTY—Application 7435. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, for 10 gallons per minute from source 1, for 50 gallons per minute from source 2, for 10 gallons per minute from source 3, total 70 gallons per minute from (1) Rock Spring, (2) Jackass Creek, (3) unnamed spring tributary to (1) and (3) Jackass Creek and (4) Ten Mile Creek to be diverted in Sec. (1) 7 T. 13 S., R. 29 E., (2) Sec. 1, T. 13 S., R. 28 E., (3) Sec. 6, T. 13 S., R. 29 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$5,500.

FRESNO COUNTY—Application 7436. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, for 5 gallons per minute from unnamed spring tributary to Ten Mile Creek to be diverted in Sec. 1, T. 13 S., R. 28 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$25.

FRESNO COUNTY—Application 7437. Div. of Highways, Dept. of Public Works, State of Cal., c/o C. H. Purcell, State Highway Engr., Public Works Bldg., Sacramento, for 5 gallons per minute from unnamed spring tributary to Ten Mile Creek to be diverted in Sec. 1, T. 13 S., R. 28 E., M. D. B. and M. For industrial and recreational purposes. Estimated cost \$25.

SANTA CLARA COUNTY—Application 7438. J. D. Grant Co., Mt. Hamilton Road, San Jose, for 700 acre-feet per annum from headwaters of Arroyo Aguague tributary to Penetencia Creek, thence Cayote River to be diverted in Sec. 12, T. 7 S., R. 2 E., M. D. B. and M. For irrigation purposes (200 acres). Estimated cost \$2,500.

MONO COUNTY—Application 7439. Ruby H. Cunningham, c/o Brobeck, Phleger and Harrison, attorneys, Crocker Bldg., San Francisco, for 2 c.f.s. from Wilson Springs tributary to Mono Lake to be diverted in Secs. 35 and 36, T. 2 N., R. 25 E., M. D. B. and M. For power purposes (152.3 h.p.). Estimated cost \$1,000.

MONO COUNTY—Application 7440. Ruby H. Cunningham, c/o Brobeck, Phleger and Harrison, attorneys

(Continued on page 38)

Widening of Yolo Causeway, Largest Bridge Project, Provides Many Jobs

WORK has started on the Yolo Causeway widening. Men, equipment and materials have been rapidly assembled for the construction of the twenty feet additional width on the three-mile trestle over the Yolo By-pass west of Sacramento to provide a wide, safe crossing for the heavy automobile traffic between the Bay District and the Capital City.

Hugh K. McKeivitt, attorney for the Highway Commission, removed the last legal barrier on November 7 by approving the half million dollar contract of the successful Sacramento bidders and Superintendent Bohnett immediately began preparations for driving test piles and removing portions of the present concrete piers at the east channel.

Field offices, tool houses and equipment yards have been established on the east levee and within a few days the construction of this, the largest bridge project on the State Highway System to date, will be well under way.

WIDESPREAD BENEFIT

For weeks hundreds of men in the mills and woods of the Redwood Empire have been employed in getting out piling and timbers for the bridge. Carload and truckload shipments are now arriving daily and will continue for several months. Bolt manufacturers, steel fabricators and foundries will soon be called upon to furnish hundreds of tons of metal. A quarter million feet of fir timber will be used in addition to the redwood. Several hundred cubic yards of Portland cement concrete for the lift span piers and literally trainloads of asphalt concrete for the riding surface will be required.

One of the pile driving rigs has already driven the test piles and several bents of four piles each. Additional drivers will be added to handle the piling as it is delivered. It is also planned to place the timber caps, stringers and flooring as soon as possible after delivery. Careful planning and execution of the work under this contract are necessary in order to complete within the 180-day limit.

The funds to finance this and a number of other projects has been advanced as an emergency relief measure from Federal Aid

allotments. The objective of this measure is temporary relief during the coming winter and spring by advancing the dates of highway construction work to a period when employment is sorely needed.

Hence with immediate and widespread relief within the State as a primary consideration, the choice of materials was logically directed to those, the production of which would involve the greatest percentage of labor and afford the widest distribution of the expenditure. For this reason, timber and more specifically, redwood was specified for the majority of the piling and superstructure lumber. With this material practically every dollar will be spent within the State and of every dollar probably ninety-five cents will go to labor either directly or indirectly.

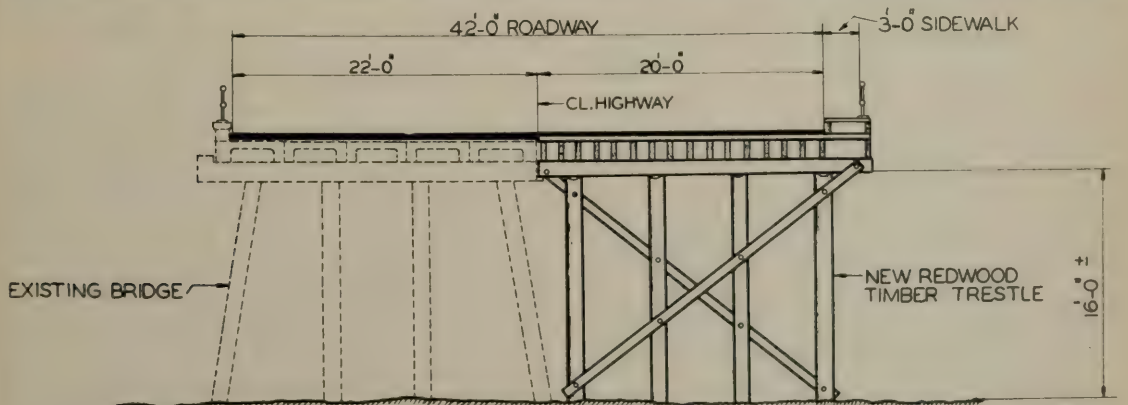
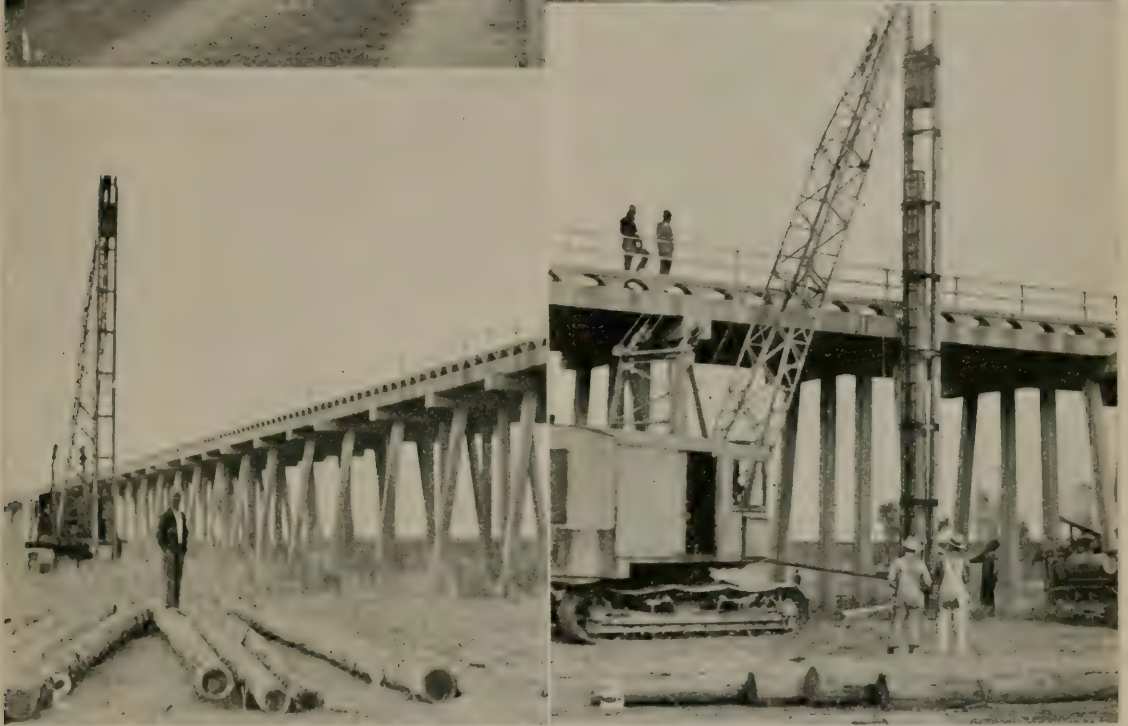
INDUSTRY STIMULATED

While the labor required at the bridge site and the direct labor benefit in the adjacent territory will be relatively small, the project provides a tremendous stimulus to the timber industry in the northern counties, the effect of which will be felt throughout the State. Mills which have been idle or running at only part capacity are now running full blast to furnish the six million feet of structural lumber to be used on the causeway and incidentally, as a necessary by-product, many times that amount of lumber of lower grades not suitable for bridge work.

Literally thousands of workers in the mills, the woods and on the logging railroads are being employed in producing this order, thus spreading unemployment relief to the entire redwood belt. That area is also being scoured for piling available for immediate delivery and the purchasing of small lots from individual ranchers is further extending the distribution of funds to small property owners, local teamsters, truckmen, and laborers. More effective and general distribution would be difficult.

Manager: "A customer has made a complaint that the coffee tastes like mud."

Cook (facetiously): "Tell him it was ground this morning."—*San Joaquin Power Magazine*.



HUNDREDS OF JOBS throughout the State have already been provided by the Yolo Causeway widening project now under way. No. 1 shows the 22-foot roadway 3 miles long, scene of numerous accidents. Nos. 2 and 3 were snapped as the pile drivers started work. The cross-section sketch explains how the roadway will be widened 20 feet and a 3-foot sidewalk added.

Permits Granted to Water Users

(Continued from page 35)

Crocker Bldg., San Francisco, for 0.125 c.f.s from Wilson Springs tributary to Mono Lake to be diverted in Secs. 35 and 36 T. 2 N., R. 25 E., M. D. B. and M. For recreational and domestic purposes. Estimated cost \$1,000.

MONO COUNTY—Application 7441. Ruby H. Cunningham, c/o Brobeck, Phleger and Harrison, attorneys, Crocker Bldg., San Francisco, for 0.25 c.f.s. from Wilson Springs tributary to Mono Lake to be diverted in Secs. 35 and 36 T. 2 N., R. 25 E., M. D. B. and M. For irrigation purposes (20 acres). Estimated cost \$1,000.

SAN BERNARDINO COUNTY—Application 7442. George W. Spencer, 1452 Sunset Blvd., Los Angeles, for 6 c.f.s. from Rattlesnake Canyon tributary to Mojave Desert to be diverted in Sec. 27, T. 3 N., R. 3 E., S. B. B. and M. For irrigation purposes (1280 acres). Estimated cost \$60,000.

SAN BERNARDINO COUNTY—Application 7443. George W. Spencer, 1452 Sunset Blvd., Los Angeles, for 10 c.f.s. from Baldwin Lake to be diverted in Sec. 5, T. 2 N., R. 2 E., S. B. B. and M. For irrigation purposes (1280 acres). Estimated cost \$75,000.

SAN BERNARDINO COUNTY—Application 7444. George W. Spencer, 1452 Sunset Blvd., Los Angeles, for 8 c.f.s. from Arrastra Creek tributary to Mojave Desert to be diverted in Sec. 27, T. 3 N., R. 2 E., S. B. B. and M. For irrigation purposes (1280 acres). Estimated cost \$60,000.

SHASTA COUNTY—Application 7445. Lovina E. Hull, Big Bend, for 3 c.f.s. from Pit River tributary to Sacramento River to be diverted in Sec. 36, T. 37 N., R. 1 W., M. D. B. & M. For power purposes (3 h.p.). Estimated cost \$25.

LOS ANGELES COUNTY—Application 7446. Mrs. Flora Stewart, 4037 W. Eighth Street, Los Angeles, for 0.10 c.f.s. from unnamed spring tributary to Boneyard Canyon; thence Mojave Desert to be diverted in Sec. 25, T. 4 N., R. 8 W., S. B. B. and M. For irrigation and domestic purposes (5 acres).

MONO COUNTY—Application 7447. Champion Silliman, Inc., c/o Preston and Braucht, attorneys, 309 Bank of America Bldg., Merced, for 1 c.f.s. from Iron Springs tributary to Milner Creek, thence Owens River to be diverted in Sec. 13, T. 4 S., R. 33 E., M. D. B. and M. For power purposes (250 h.p.). Estimated cost \$100.

TUOLUMNE COUNTY—Application 7448. Mrs. Emma Schmidt, c/o M. H. Schnapp, 80 San Andreas Way, San Francisco, for 1 miners' inch from springs tributary to Mateot Gulch, thence South Fork Stanislaus River to be diverted in Sec. 11, T. 2 N., R. 14 E., M. D. B. and M. For irrigation and domestic purposes (1 acre).

SISKIYOU COUNTY—Application 7449. L. H. Cornell and A. J. Phillips, c/o L. H. Cornell, Seiad, for 3 c.f.s. from Sawmill Creek tributary to Seiad Creek, thence Klamath River to be diverted in Sec. 32, T. 47 N., R. 11 W., M. D. B. and M. For mining and domestic purposes.

PERMITS ISSUED

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of November, 1932

NEVADA COUNTY—Permit 4016, Application 6776. Blue Lead Consolidated Mining Co., North Bloomfield, November 7, 1932, for 2.00 c.f.s. from Logan Canyon, tributary to South Fork Yuba River in Sec. 4, T. 17 N., R. 10 E., M. D. B. and M. For mining purposes. Estimated cost \$500.

SISKIYOU COUNTY—Permit 4017, Application 7313. Gearhart Mining Co., Happy Camp, November 7, 1932, for 3.00 c.f.s. from Coon Creek, tributary South Fork Indian Creek, thence Klamath River in Sec. 4, T. 17 N., R. 6 E., H. B. and M. For mining purposes.

LOS ANGELES COUNTY—Permit 4018, Application 7107. H. H. Townsend, 6039 Hollywood Blvd., Los Angeles, November 9, 1932, for 0.001 c.f.s. from Fisher Spring, tributary to Piru Creek watershed in Sec. 19, T. 6 N., R. 17 W., S. B. B. and M. For domestic and stockwatering purposes.

LOS ANGELES COUNTY—Permit 4019, Application 7256. U. S. Angeles National Forest, 501 Brownstein-Louis Bldg., Los Angeles, November 9, 1932, for 0.003

c.f.s. from Fisher Creek tributary to Piru Creek watershed in Sec. 19, T. 6 N., R. 17 W., S. B. B. and M. For fire protection and recreational purposes. Estimated cost \$100.

EL DORADO, ALPINE and AMADOR COUNTIES—Permit 4020, Application 5618. Pacific Gas and Electric Company, 245 Market Street, San Francisco, November 22, 1932, for 43,500 acre-feet per annum from South Fork American River and tributaries tributary to American River in Sec. 1, T. 11 N., R. 17 E., in Sec. 30, T. 12 N., R. 17 E., in Sec. 18, T. 10 N., R. 18 E., in Sec. 32, T. 10 N., R. 17 E., in Sec. 16, T. 11 N., R. 11 E., M. D. B. and M. For power purposes, developing 1750 h.p.

SISKIYOU COUNTY—Permit 4021, Application 7262. George H. Cory, Callahan, November 22, 1932, for 3.00 c.f.s. from Little Carmen Creek, tributary to Grouse Creek, thence East Fork Scott River in Sec. 29, T. 40 N., R. 7 W., M. D. B. and M. For power and domestic purposes, developing 25.56 h.p.

SISKIYOU COUNTY—Permit 4022, Application 7263. George H. Cory, Callahan, November 22, 1932, for 3.00 c.f.s. from Little Carmen Creek, tributary to Grouse Creek, thence East Fork Scott River in Sec. 29, T. 40 N., R. 7 W., M. D. B. and M. For mining and domestic purposes.

MONTEREY COUNTY—Permit 4023, Application 7324. Louise Matter, Box 528, North San Diego, November 22, 1932, for 0.025 c.f.s. from unnamed spring, tributary to San Clemente Creek, thence Carmel River in Sec. 30, T. 17 S., R. 2 E., M. D. B. and M. For domestic purposes. Estimated cost \$25.

FRESNO COUNTY—Permit 4024, Application 7184. Div. of Fish and Game, State of Cal., November 23, 1932, for 3.00 c.f.s. and 20 acre-feet per annum from San Joaquin River, tributary to San Francisco Bay in Sec. 7, T. 11 S., R. 21 E., M. D. B. and M. For recreational (fish culture) and domestic purposes. Estimated cost \$5,000.

PLACER COUNTY—Permit 4025, Application 7260. A. A. Gorman, Michigan Bluff, November 23, 1932, for 3.00 c.f.s. from Peavine Creek, tributary North Fork Middle Fork American River in Sec. 14, T. 14 N., R. 12 E., M. D. B. and M. For mining and domestic purposes, estimated cost \$3,000.

EL DORADO COUNTY—Permit 4026, Application 7340. R. A. Easley, Antioch, November 23, 1932, for 200 gallons per day from unnamed spring tributary to South Fork American River in Section 24, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

EL DORADO COUNTY—Permit 4027, Application 7341. L. W. Mehaffey, Antioch, November 23, 1932, for 200 gallons per day from overflow of Geo. W. Harter Spring tributary to South Fork American River in Sec. 24, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

INYO COUNTY—Permit 4028, Application 3381. City of Los Angeles and Board of Water and Power Commissioners of City of Los Angeles, 207 S. Broadway, Los Angeles, November 29, 1932, for 47.00 c.f.s. and 8554 acre-feet per annum from Cottonwood Creek and South Fork Horseshoe Meadows Fork and Round Meadows Fork of Cottonwood Creek, tributary to Owens Lake in Secs. 9, 11, 14, and 15, T. 17 S., R. 35 E., in Sec. 18, T. 17 S., R. 36 E., M. D. B. and M. For power purposes developing 11,338 h.p. Estimated cost \$1,936,300.

INYO COUNTY—Permit 4029, Application 3382. City of Los Angeles and Board of Water Power Commissioners of City of Los Angeles, 207 S. Broadway, Los Angeles, November 29, 1932, for 105.00 c.f.s. and 8177 acre-feet per annum from Big Pine Creek, South Fork Big Pine Creek and unnamed stream, tributary to Owens River in Secs. 26, 32, 33, 34, and 36 T. 9 S., R. 32 E., in Sec. 34, T. 9 S., R. 33 E., in Sec. 3, T. 10 S., R. 32 E., M. D. B. and M. For power purposes developing 27,915 h.p. Estimated cost \$3,188,000.

INYO COUNTY—Permit 4030, Application 3734. City of Los Angeles and Board of Public Service Commissioners of City of Los Angeles, 207 S. Broadway, Los Angeles, November 29, 1932, for 5.00 c.f.s. from Symmes Creek in Sec. 9, T. 14 S., R. 34 E., M. D. B. and M. For municipal purposes. Estimated cost \$49,000.

Geyersville Bridge Officially Opened at Dedication Ceremony

UNDER smiling skies, Sonoma County's new 1000-foot "Geyersville Bridge" on the Geyser Highway between Napa and Sonoma counties, was formally dedicated to public use Sunday, November 6th, with colorful ceremonies, under the direction of the Redwood Empire Association, in cooperation with the Napa and Sonoma County Boards of Supervisors, the Geyersville Chamber of Commerce and fire department and Calistoga Chamber of Commerce.

Several thousand persons participated in the celebration, including Federal, State, county and city officials, chambers of commerce, Farm Bureau and Grange representatives, newspaper publishers and others.

Andrew Rocca, Mayor of Calistoga, and director of the Redwood Empire Association, officiated as master of ceremonies.

Highway Commissioner Timothy A. Reardon of San Francisco officially represented Governor James Rolph, Jr., at Sunday's fete.

OFFICIALS ON PROGRAM

Dr. Joseph M. Toner, Director State Department of Institutions, delivered an address as part of the dedicatory program.

Other State officials included in the speaking list were: L. V. Campbell, office engineer, California State Highway Commission, of Sacramento; Harold McCurdy, district office engineer, California Highway Commission, San Francisco. Brief addresses were also delivered by: Everett Lampson and Ray Brackett of the Geyersville Chamber of Commerce; Mayor Andrew Rocca of Calistoga; L. J. Peterson, president Associated Chambers of Commerce of Sonoma County; Supervisor Ed Enzenauer, chairman, Sonoma County Board of Supervisors; Ralph Minahan, supervisor from Napa County; Ed Peugh, county engineer of Sonoma County; J. A. McMinn, highway committeeman for Sonoma County, Redwood Empire Association; M. W. Moody, California State Automobile Association; Assemblyman Hubert Scudder of Sonoma and Marin counties; Judge J. A. Ellis, whose father, as chairman of the Sonoma County Board of Supervisors, built the first bridge in Geyersville in 1885, and Rodney Messner, county engineer of Marin County.

MUSIC AND DANCING

Entertainment features were presented by the Lytton Industrial Home and Calistoga High School bands; dance by Miss Marian Rocca of Calistoga; singing by Miss Eliza Banta Crane of Geyersville, accompanied by Mrs. Helen Bessa.

The dedicatory address was delivered by Senator Herbert Slater of Sonoma County, following which the bridge was christened by "Miss Redwood Empire"—Miss Florence Buchignani of Geyersville.

Geyser girls from Calistoga (Jane Lee, Susanna Bernard and Ruth McClure) and Redwood girls from Geyersville (Ruth Rose, Rosie Stefani and Vivian Hunt) then held the ribbon barrier which was cut by Miss Redwood Empire as the official cars drove across the bridge for the first time, thereby opening the bridge to traffic.

Traffic is only as dense as the folks who drive the autos.

Cordelia-Fairfield Relocation Reduces Curves and Mileage

THE new section of State Highway on the Oakland-Sacramento route between Cordelia and Fairfield was opened to traffic the day before Thanksgiving, thus giving the holiday traffic the advantage of a new 20-foot cement concrete pavement making a shorter, straighter and smoother road between these points.

This is one unit of the ultimate direct route proposed between Oakland and Sacramento. It was selected for construction at this time ahead of other portions of this route because it included one and one-half miles of old 15-foot pavement and a hazard to traffic in the old bridge over Suisun Creek. This was the only piece of 15-foot pavement left on the entire route and was expensive to maintain as well as hazardous.

The new location beginning on the old road northeast of Cordelia and extending to the present road at the County Hospital west of Fairfield saves three-quarters of a mile in distance, besides having only three curves with radii of 4000 feet and over with a total angle for the three of $41^{\circ} 18\frac{1}{2}'$. The old line had fourteen curves with radii as short as 300' and a total angle for all of $280^{\circ} 28'$.

The contract included about 5.65 miles of 20' Portland cement concrete pavement, with oiled rock borders 2' wide, and three-quarters of a mile of grading to improve the section on the present location west of Fairfield; 0.35 of a mile of the above pavement is in a curve change just east of Fairfield, which replaces a 300' radii curve with one of 800' radius.

The total cost of the job was approximately \$206,400.

ALL READY FOR 1933 SNOW SURVEYS

(Continued from page 31)

hearing was held at the State Capitol at Sacramento on November 17th.

The members of the Board of Engineers on this investigation included the following: Col. William J. Barden, Col. Edward H. Schulz, Col. George M. Hoffman, Col. Thomas H. Jackson, Lieut. Col. Warren T. Hannum.

The Board was accompanied by Lieut. Col. Thomas M. Robins, Division Engineer of the Pacific Division; Capt. J. C. Drinkwater, District Engineer, Sacramento District of the Pacific Division; Lieut. Conrad P. Hardy of the San Francisco District Office; Mr. C. I. Grimm, Principal Engineer; and Arnold Weeks, Senior Hydraulic Engineer from the office of the Board of Engineers of Washington, D. C.

The Board was conducted on this trip of investigation by Edward Hyatt, State Engineer, and his staff. Congressman Albert E. Carter of the Sixth District, accompanied the party throughout the trip.

The Federal interest and responsibility on practically all phases of the Great Central Valley Project were particularly stressed before the Board. It is hoped that this personal investigation of the project by the Board of Engineers will result in recommendations to Congress for liberal Federal participation in the project in a greater amount than that recommended heretofore.

State Road Crews Praised for Quick Repairs After Flood

IN A RECENT letter forwarded to State Highway Engineer C. H. Purcell, by E. E. East, Chief Engineer of the Automobile Club of Southern California, enclosing a report by Don Doig, head of the club's touring bureau, on the damage done by the recent Tehachapi flood, some complimentary references are made to the quick work of the State maintenance forces in repairing and getting the highway open to traffic.

After describing in detail the course of the flood waters unleashed by cloudbursts in the mountains and the extensive damage inflicted on property and highway in Woodford Canyon Mr. Doig says:

"The water when striking the mountain was immediately caromed off and scoured out for about an eighth of a mile the entire automobile road. Imagine, if you can, the State Highway Department, less than seventy-two hours after the flood, having built out of the granite wall a road sufficiently wide to permit automobile travel, and in place of keeping the road blocked to all traffic, they were, at the time the writer made his observations, allowing traffic to pass over this road every twenty minutes.

"I would judge there were at least forty men working on that one short stretch with compressors, drills and pick and shovel and the evidence of efficiency was most refreshing. There was not a lost motion and while practically all of it was hand work, not an arm came up from the ground but it carried a rock to be deposited in the truck and later carried forward to the edge of the road and there dumped.

"The remaining road down the Tehachapi to Bena Station was undamaged but here the flood dissipated itself due to the low area and spread out over a mile wide, losing itself eventually in the Kern Mesa near Arvin. The railroad bridge and highway bridges naturally collapsed but the State highway again immediately had in scrapers and tractors and constructed a very good detour around both obstacles. In fact there was but one 50-foot section through a small low spot that any mud was encountered on the entire trip.

"All in all, the rapidity and efficiency of the State Highway Department was most refreshing and the good natured superintendent of construction on the job went untold lengths toward creating a very friendly feeling on the part of the touring public."

TIMING QUARRELS

Magistrate (to woman involved in matrimonial dispute)—Did you and your husband quarrel on Friday night?

Wife—And the next day pay day? Certainly not!
—*Wall Street Journal*.

Since the first automobile was sold in 1898 more than 53,000,000 motor vehicles have been built.



PIONEER WOMEN who traveled the old Mormon Trail in the San Bernardino Mountains are commemorated by this monument surmounted by a replica of a covered wagon wheel. It marks a place where the trail crossed the Waterman Canyon State highway.

Old Mormon Trail Marked by Monument

IN 1852 the only road into the western portion of the San Bernardino Mountains was known as the Mormon Trail. It was a very steep, narrow road over which the early pioneers hauled logs and lumber from the San Bernardino Mountains to build their homes in the valley below and over which they traveled in summer to camp in the San Bernardino forests.

Traces of the old road, almost obliterated by time, are still visible in places. At a point where this old Mormon road crossed the present State highway through Waterman Canyon to the Rim o' the World, a monument has been erected of native granite rock surmounted by the cement cast of a wheel taken from one of the pioneer wagons. Embedded in the monument is a bronze plaque which reads:

Mormon Road
Built By the Pioneers
Dedicated to
the Pioneer Women
of 1852
By the Women of 1932

The monument was erected by a women's organization of Crest Forest, the Thursday Club, under the presidency of Mrs. Sara M. Switzer and dedicated October 10th, with appropriate ceremonies, attended by representatives of the San Bernardino Chamber of Commerce, and other organizations.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

EARL LEE KELLY-----Director

ERIC CULLENWARD-----Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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PHILIP A. STANTON, Anaheim

FRANK A. TETLEY, Riverside

C. H. PURCELL, State Highway Engineer, Sacramento

JOHN W. HOWE, Secretary

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T. E. STANTON, Materials and Research Engineer

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C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding

CHARLES H. WHITMORE, District III, Sacramento

J. H. SKEGGS, District IV, San Francisco

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R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

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Resources Investigation

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H. M. STAFFORD, Sacramento-San Joaquin Water
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CARLETON PIERSON, Supervising Specification
Writer

C. E. BERG, Supervising Estimator Building Con-
struction

J. W. DUTTON, Principal Engineer, General Con-
struction

W. H. ROCKINGHAM, Principal Mechanical and
Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample

DEC 28 1932

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

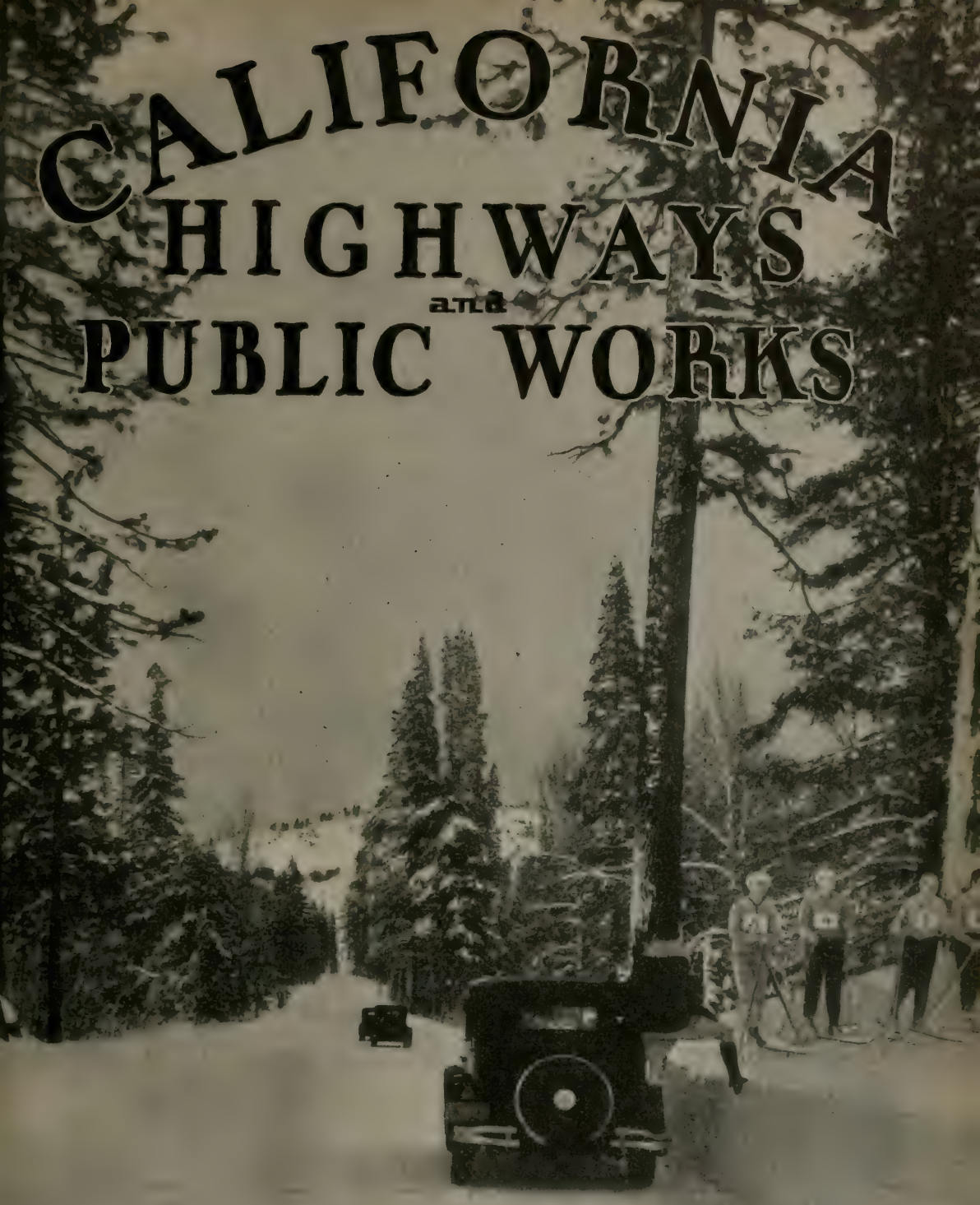
1931

LEGEND

Primary Roads
Secondary Roads



CALIFORNIA HIGHWAYS and PUBLIC WORKS



A California Winter Sports Highway
State Route 37 • Auburn to Truckee •

Official Journal of the Department of Public Works

JAN.-FEB. State of California

1933

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Highway Commission Sets \$61,700,000 Total for 1933-35 Biennial Budget

Proposed Improvements Include 77 Projects Covering
360 Miles in North Section of State and 74
Totalling 510 Miles in the South

THE Biennial State highway budget recommending expenditures of \$61,700,000 on the State highway system for the ensuing two fiscal years, has been completed by the California Highway Commission and presented to Governor Rolph. It covers the biennial period from July 1, 1933, to June 30, 1935.

The budget provides for contemplated expenditures from funds which it is estimated will become available in the next biennium, for all State highway purposes including construction, reconstruction, maintenance, purchase of right of way, engineering and administrative cost.

The distribution of the money between the northern and southern counties, between primary and secondary highways, is in accordance with the provisions of the Breed Act.

151 PROJECTS SCHEDULED

Major projects proposed for construction and reconstruction provide for improvement of 77 projects in the north section of the State and 74 projects in the south section of the State. These projects lie on 28 different routes in the north and 21 different routes in the south. The total mileage involved in these projects is 360 miles in the north and 510 miles in the south.

Of the mileage involved in the north, 130 miles are financed from the reconstruction fund and 230 miles from construction and general funds. Of the mileage in the south to be improved, 265 miles are financed from reconstruction funds and 245 miles from construction and general funds.

Revenue in the State highway construction fund—the one-cent fuel tax, which was put into effect in 1927—is allocated 75 per cent to primary highways and 25 per cent to secondary highways. The funds for construction of primary highways are divided between the north and south sections of the State in proportion to the mileage of primary high-

ways in each section. The funds for construction on secondary highways are equally divided between the north and south sections of the State. Ten per cent of the secondary highway construction fund is appropriated by law for State cooperation in joint highway districts, and is divided in equal amounts between the north and south sections of the State.

DIVISION OF FUNDS

Federal aid funds contributed by the Federal government constitute the highway general fund. It is available for construction and reconstruction and is divided between the north and south sections of the State in proportion to the mileage of primary highways in each section.

The Federal aid allotment from the Federal government is contingent upon appropriations made by Congress and must be earned by expenditure of State funds on the 7 per cent Federal Aid Highway System. It is expected that California will receive about \$8,000,000 in Federal aid during the next biennium.

As provided in the Breed Act of 1927, the basis for expenditures for construction and reconstruction of primary highways in the north and south sections of the State is the mileage of adopted primary highways in the respective sections. In the north section primary mileage is 2341 miles and in the south section of the State 1920 miles. This gives a ratio of 54.9 per cent for the northern counties and 45.1 per cent for the southern counties.

SECONDARY HIGHWAYS

In the secondary highway system of the State, there are 1941 miles in the north and 1147 miles in the south. Three hundred and forty-five miles of secondary highways are recommended for inclusion at this session of the Legislature. Maintenance of this additional mileage has been provided for in the 85th and 86th fiscal year budget.

(Continued on page 31)

Highway Dollar Spreading to 50,000 Californians Through 12,000 Workers

By MORGAN KEATON, Assistant Deputy Director of Public Works

ROAD construction in the past three years has taken a large place in the Nation's activities and has in a large measure helped to provide employment for skilled and unskilled labor which machinery has partially displaced in other industries.

Road construction in California has amended itself to relieve unemployment for the State as has no other industry and the State in turn has received full value for every dollar expended in highway betterments and improvements.

The State is now carrying out its second winter program for unemployment relief through the Department of Public Works. At the present time highway dollars are taking care of approximately 50,000 people in California through the money earned by the 12,000 workers. The latter represent contractors' crews engaged on State jobs, family men in relief quota maintenance crews and others regularly employed on highway work in all parts of the State. Through the hands of these people the highway dollar is divided among an ever-widening circle of merchants, manufacturers, farmers and their families and employees.

ORDERED BY GOVERNOR

Early in the season Governor James Rolph, Jr., gave strict orders that only people with a number of dependents should be eligible for highway relief employment work, which policy has been strictly adhered to by the Department of Public Works.

For this winter of 1932 and 1933 an appropriation of \$1,850,000 has been made to date to carry on a relief program similar to the work of last winter. Of this total \$300,000 was allotted to the Department of National Resources for the employment of single men

on highway protective work in forest camps established throughout the State; \$1,430,000 has been devoted to relief employment for family men on three-day-a-week work at \$4.00 per day throughout our highway districts, and \$120,000 is being used for the Arroyo Seco Camp in Los Angeles County, where 300 single men are now securing clothing, shelter and subsistence in return for six hours per day work.

At the present time there are employed on the three-day-a-week maintenance work about 3500 men from the relief quotas and before the season closes a total of some 4500 heads of families will have been aided.



MORGAN KEATON

NEED MUCH GREATER

This grand total is not as great as that of the previous year because the appropriation is smaller by \$416,070. However, the need this winter has been even greater than that of the last two previous winters. Therefore, it has been more difficult to select the most needy for this employment.

The average number of dependents this winter will run between four and five as compared with the average number of dependents last year which ran about three to a family. This means that more people are actually being directly benefited on less funds than during the previous period.

The work of our maintenance crews has accordingly been expanded to take care of twice the number of employees at hand labor as would have been used in ordinary times, in order to give the largest possible spread of employment to heads of families properly selected for the work.

FINE COOPERATION

The selection of the successful applicants for this relief work has been due to the splen-

(Continued on page 18)



VALUE RECEIVED in permanent highway improvements made by hand labor on maintenance quotas under the unemployment relief program of the Department of Public Works is illustrated in the above series of photographs depicting the kind of work the pick and shovel crews are doing. No 1 shows a slope cut back to "daylight" a curve with shoulder graded and graveled. In No. 2 are shown rock border gutters nicely placed at foot of steep slopes. No. 3—Crews at work cleaning slopes of loose material preparatory to widening operations. No. 4—Excavating boulders from roadside embankment to permit extending right-of-way. No. 5—Constructing rock retaining wall for protection from scour at a point where drainage enters the right-of-way. No. 6—An extensive widening project involving grading of shoulders and constructing of protective rock walls.

Piru Creek Forced to 'Zoom' 60 Feet Out of Huge New Concrete Channel

By R. C. MYERS, Assistant Engineer—District VII

A VERY interesting example of one of the many problems confronting the highway engineer in making new locations across rugged, mountainous country, is a major channel change in Piru Creek Gorge on the Alternate Ridge Route now under construction. This channel change is located between French Flat and Liebre Creek, or about 13 miles from Castaic School, the southerly end of the project. The drainage area upstream at this point totals about 300 square miles of mountainous territory, so that in times of heavy rainfall, floods of considerable magnitude may be expected.

The location along this portion of the new route follows through Piru Creek Gorge, the lowest natural pass through the territory on the logical line for the highway.

The new route is to be a high speed highway built on modern standards of alignment and grade, with 1000 ft. minimum radius for curves and a 6% compensated maximum grade. In following the devious course of Piru Creek it is necessary to cross and recross it several times in order to avoid making any but very gradual curves.

OBVIATES TWO BRIDGES

The located line crosses the channel of Piru Creek at two places about 1900 feet apart, where the stream makes a sharp turn. The most obvious procedure would have been to build a bridge at each location where the highway is to cross the stream bed. Another solution was to change the course of the stream by cutting through a point around which the stream ran.

It was evident that there would be several serious difficulties encountered if the channel change were adopted instead of the construction of the two bridges. A cut running up to 75 feet in depth would be necessary, involving the removal of 118,000 cubic yards of earth and rock.

With the stream channel shortened considerably by the change, a much higher velocity would be attained by the water than in the old stream bed. As the new roadway embankment would be alongside this new channel, it was apparent that in times of high water the

embankment would be undercut and seriously damaged unless some means were provided for controlling the erosion.

The stream flow is only a few second-feet most of the year, but in years when there is heavy snowfall, it reaches torrential proportions in the spring months. Huge boulders are rolled down the stream bed.

COST PROBLEM INVOLVED

A new channel must necessarily be lined with concrete of sufficient thickness and sufficiently reinforced by steel bars to withstand the action of boulders. It would also have to have a carrying capacity sufficient to carry the largest flow of water that could possibly be expected in this creek.

With these requirements in mind, the job for the engineers was to design and carefully estimate the cost of the channel change and compare the cost of this solution of the problem with the cost of constructing two bridges with the necessary bank protection at the approaches.

A concrete-lined channel varying from 40 feet to 90 feet in width on the bottom and 25 feet deep, with a carrying capacity of 40,000 cubic feet of water per second, was designed. The bottom and sides were designed with concrete 1 foot thick for a distance of 16 feet up from the bottom. The sides tapered to a thickness of 6 inches at the top.

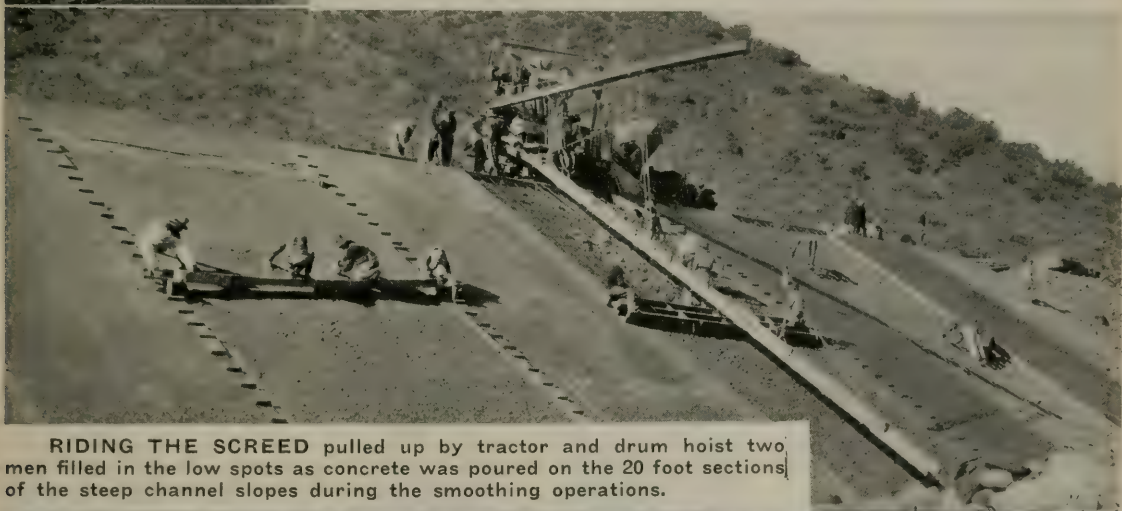
A careful estimate of the cost of this construction was made and also of the plan in which two bridges would be constructed. It was found by comparing these estimates that a saving of about \$75,000 could be effected by constructing the channel change. This plan was accordingly adopted.

Power shovels were used in excavating the new channel, and the excavated material was hauled in trucks to make the nearby highway embankments.

NOVEL SMOOTHING METHOD

Concrete was poured on the channel slopes in 20-foot sections. It was smoothed by a heavy screed which was pulled up the slope very slowly by means of a tractor and drum hoist. Two men would ride this screed, filling

(Continued on page 18)



Snow Removal Pays in Savings to Traffic and Increased Fuel Revenue

By T. H. DENNIS, State Maintenance Engineer

DURING the winter of 1931-32, snow was removed on 2047 miles of State highways at a cost of \$285,600, or approximately 43 cents for each of the 662,500 machines using these roads during that period. Assuming each machine traveled 150 miles making 14.5 miles to the gallon of gasoline—averages determined in the joint survey conducted by the United States Bureau of Public Roads and the Division of Highways—then the return of $41\frac{1}{2}$ cents per machine in gas tax almost equalled the cost of removal.

That business in general profited by this removal is apparent from the March, 1932 report of the California State Chamber of Commerce, which showed that \$1,502,307 was expended by motorists, for transportation alone, to the winter sports areas.

Since the mileage cleared in recreational areas was but 20 per cent of the total, the complete expenditure directly attributable to an open road might conservatively be expanded to several times the Chamber's figures.

DONNER SUMMIT RECORD

A concrete example of direct savings to the motorists is exemplified in the clearing of the Donner Summit. This historic summit, the barrier to the ill-fated Donner Party, reaches an elevation of 7200 feet. Records of the past 59 years show an average yearly snow fall of 34 feet, a maximum of 65 feet, and a minimum of 12 feet. Last year we moved 480 inches of snow on this road at a cost of \$70,887, or 94 cents for each of the 75,800 vehicles crossing the summit.

If we accept the United States Bureau of Public Roads estimate of 2.27 occupants per car, then over 172,000 individuals secured direct benefit from this expenditure. The railroad fare from Sacramento to Truckee is

\$5.06. If only one-quarter of the people who used the road made the trip from necessity, a total of \$217,663 would have been expended for railroad fare, and if it had been necessary to move one-tenth of the vehicles from Truckee to Sacramento by the so-called "railroad ferry" at \$15.00 per car, an additional \$113,700 would have been expended. Since the cost of keeping the summit open was \$70,887, traffic has evidently been greatly benefited by this expenditure.



T. H. DENNIS

Snow removal programs are usually planned in summer, since the special equipment required is seldom carried in stock, and must be ordered in early fall to insure timely delivery. As a consequence such programs are without the benefit of definite knowledge of the severity or mildness of the coming winter.

THOROUGHLY PREPARED

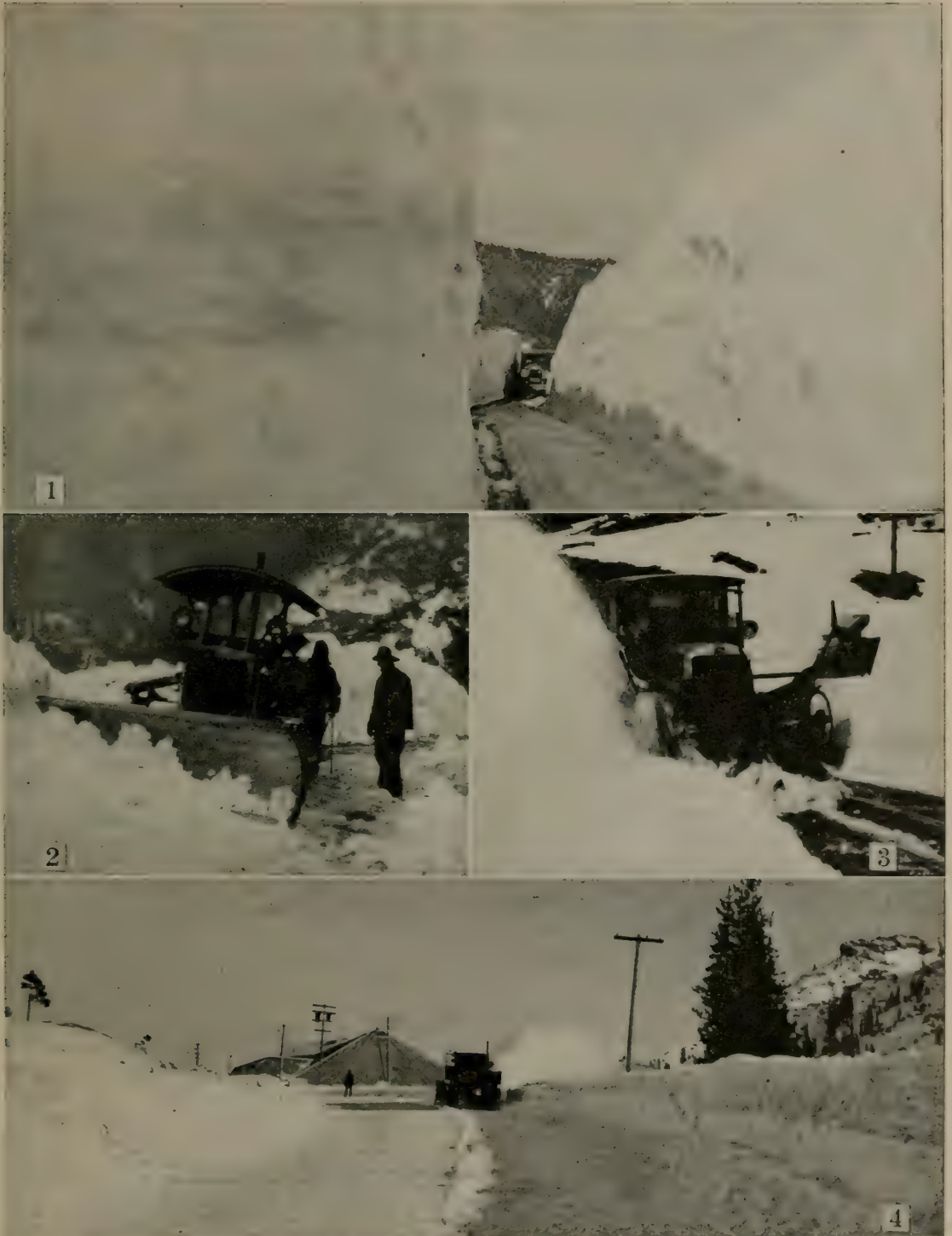
The end of this December, therefore, found us completely organized, and contrary to last, having experienced few if any major demands on the personnel and equipment provided. At the conclusion of last December 273 inches of snow had fallen on Donner Summit, 178 inches of which remained on the ground; while in the same period this year, but 80 inches had fallen, with 30 inches remaining as a pack.

Nevertheless, thorough preparation is necessary as human safety is involved, and success or failure on a particular project may be jeopardized by the lack, at the critical time, of one essential piece of equipment. Any sound plan, therefore, must anticipate at least normal demands. To provide less is to create a false confidence in our efforts, which can not be backed by performance.

ROUTES CLEARED

Last year, snow was removed on the following State routes, work on certain portions

(Continued on page 21)



WHEN SPRING COMES in the higher Sierra regions the deep snow pack has always presented a formidable and expensive problem. Experience proves it pays to keep the heavy travelled highways open. No. 1 shows the situation on Donner Summit in the Spring of 1929 before modern snow fighting equipment was kept on the job. No. 2—A tractor operated push plow at work on Cajon Pass in Southern California. No. 3—A truck rotary clearing the Crest Route in the San Bernardino Mountains. No. 4 is another view of Donner Summit taken last winter showing how the powerful modern rotary plows, maintained a wide, cleared highway for traffic throughout the winter saving thousands of dollars for motorists.

Dr. W. W. Barham of Yreka Appointed To Fill Highway Commission Vacancy

DR. WILLIAM WIRT BARHAM of Yreka, Siskiyou County, famed in highway history of California as the man who built the first mile of paved highway in the State under the 1915 bond act, was appointed a member of the California Highway Commission on December 20th last by Governor James Rolph, Jr. He fills the vacancy on the commission caused by the resignation of Earl Lee Kelly to become director of the Department of Public Works.

Dr. Barham attended his first meeting as a member of the commission on January 10th and was cordially welcomed and duly installed in office by his fellow commissioners.

SECRETARY TO CONGRESSMAN

The new commissioner is a native Californian, born in Oakland. The son of former Congressman John A. Barham, he got an early knowledge of official life when he went to Washington, D. C., as secretary to his father soon after graduating from high school in Santa Rosa. While in the national capital he attended the George Washington University and later graduated from the University of Maryland with the degree of Doctor of Dental Surgery.

Returning to Santa Rosa, he practiced dentistry three years in that city and moved to Yreka in 1905 where he established a very successful practice and became active in the political and civil affairs of the community. He was elected mayor of the city and served in that office for twelve years.

SECURED NEW HIGHWAY

It was about this time that Siskiyou county played an important part in the highway annals of the State by promising the original highway commission that if the Pacific Highway was routed through the county, the taxpayers would furnish all rights of way and build the necessary bridges.

Mayor Dr. Barham followed up this enterprising precedent by starting work on the first mile of pavement to secure the routing of the highway through the city of Yreka.

Becoming interested in banking, Dr. Barham was one of the organizers of the First National Bank of Yreka and was elected its



Dr. W. W. BARHAM

president, an office he is now holding. He has been prominent as a banker in Yreka for many years.

As chairman of the Republican County Committee he has long taken an active part in the political affairs of city, county and State.

Dr. Barham is married and has one grown son.

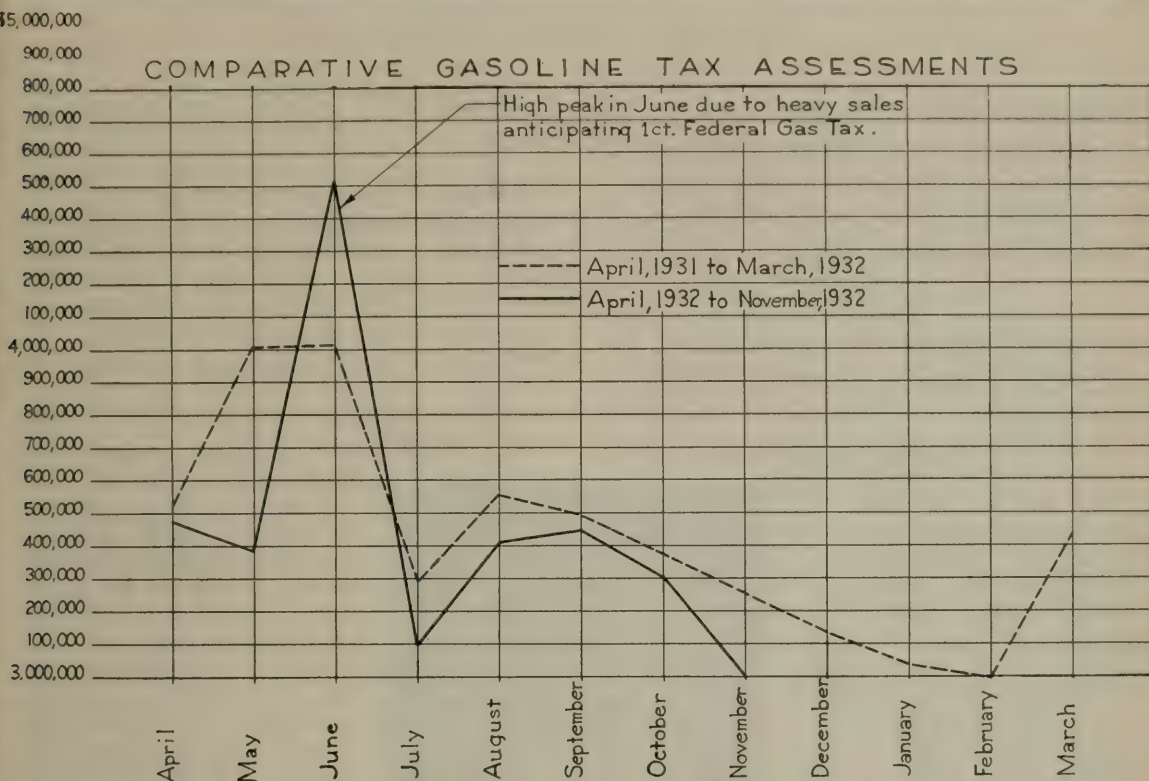
HEADS DISTRICT BUREAU

Appointment of I. L. Swearingen, Los Angeles, to the position of District Supervisor for the State Bureau of Contractors' Registration in the Southern California District, embracing 13 counties, has been announced by Col. Carlos W. Huntington, registrar of contractors.

Swearingen, who has been actively engaged in the contracting business in Los Angeles for more than 10 years, will succeed the late Hal G. Stiles. He is a world war veteran and former Commander of Post 345 of the American Legion.

Gasoline Tax Continues to Shrink

COMPARATIVE GASOLINE TAX ASSESSMENTS



GASOLINE tax assessments for the twelve months of 1932 as shown by complete returns for the year registered a decrease of \$1,454,554 compared with the like period of 1931.

The receipts for 1932 totaled \$40,171,338 as against \$41,625,892.

The trend of recent months indicate the revenues from this source are continuing to show a loss and that the rate of decrease up until December was steadily increasing. The accompanying chart showing assessments for the comparative months of 1931 and 1932 illustrates this downward trend and indicates that if the present rate of decrease is projected into the next biennium a serious reduction in gasoline tax revenue will result.

It is not possible to make monthly comparisons prior to April 1, 1931 when the law providing for monthly assessments instead of quarterly returns went into effect but the first quarter of 1932 showed a loss of \$512,322 compared with the 1931 period.

A comparison of the eight months beginning April 1, 1932 with the 1931 figures shows a decrease in assessments levied for that period of \$890,894.19, or slightly over 3 per cent.

Except for the month of June 1932 which showed an increase due to large distributions in that month by wholesalers in order to avoid the Federal tax of 1 cent which became effective in July, every month of 1932 shows a steady decrease in assessment returns.

The receipts for November, especially, reveal a marked downward trend with a decrease of \$252,430.70 compared with November 1931, representing a drop of 7.7 per cent.

The December drop however shows a halt in the rather precipitous decline registered in November. The revenues for December 1932 amounted to \$3,079,245 compared with \$3,130,587 in 1931 reducing the rate of decrease to 3.49 per cent.

Chart records show that the downward trend may be expected to continue until spring.

National State Highway Body Finds Full Value Returned in Relief Work

By G. T. McCOY, Principal Assistant Engineer

REPRESENTATIVES from the State highway organizations of the forty-eight States, Hawaii and the Bureau of Public Roads met at Washington for the eighteenth annual meeting of the American Association of State Highway Officials, on November 15th, 16th and 17th last.

Mr. Harry A. Hopkins, chairman of the California Highway Commission, and the writer attended the meetings as representatives of the State highway organization of California.

It was fitting that, in the year of the bicentennial celebration of the birth of George Washington, this national organization of highway builders should meet in the Capitol City of the Nation and should share in the bicentennial ceremonies by the dedication of the Mt. Vernon Memorial Highway, recently completed between Washington and Mt. Vernon. This new boulevard represents the last word in modern highway construction and serves as an appropriate memorial to that great American statesman and soldier, who also was a pioneer road builder, surveyor and engineer—George Washington.

IN RETROSPECT

It is not the purpose of this brief article to provide a detailed report of the addresses and conference proceedings of the meeting but rather, in retrospect and with proper perspective, to present the trends of opinion as expressed by the speakers of the meeting.

The sessions of this eighteenth annual meeting opened with Thomas H. MacDonald, chief of the Bureau of Public Roads of the United States Department of Agriculture, as host, who delivered the address of welcome. Mr. MacDonald complimented the Highway Departments of the various States on the

rapidity with which they had cooperated with the Federal Government in getting under way emergency relief contracts for State highway work in both 1931 and 1932.

In two successive years, the State Highway Departments each year let to contract work covering construction on more than 7000 miles of highways, thereby providing employment to thousands of men on the work throughout the Nation and to thousands more in the manufacture and transportation of materials used in the work.

Mr. MacDonald expressed himself as favoring this form of relief to unemployment during emergencies such as have existed during the past two years, as the State Highway Departments provide an adequate set-up for quickly and efficiently putting the work in motion and when completed the improvement is a material asset to the wealth of the Nation.

HYDE SOUNDS WARNING

The second speaker was the Honorable Arthur M. Hyde, Secretary of the United States Department of Agriculture. While Secretary Hyde's address was on "Agriculture and Highways," he spoke of the three-fold problem which con-

fronts Highway Departments today: (1) decreased annual highway income; (2) large capital investments involving heavy maintenance obligations; (3) incompleteness of major road systems with a need for improvement to tremendous mileages of secondary and more strictly rural roads.

To deal with these problems, Secretary Hyde advocated the need of greater critical research and review into both the economic and physical aspects of highway improvement with the resultant fashioning of new methods and policies which will adequately cope with



G. T. McCOY

Uniform Road Standards Obtain in U.S.

(Continued from preceding page)

the changed conditions and permit continued highway development so important to the Nation.

In this respect Secretary Hyde deplored any tendency of neglecting maintenance of highways, not only in the technical sense, but also in the sense of continuous improvement consistent with traffic needs. He sounded a warning against the increase in mileage of State highway systems beyond the ability of the States to collect revenue for proper construction and maintenance, emphasizing the fact that there is a limit to the taxing power of the State for this purpose.

FULL TAX DIVERSION

He also warned against diversion of motor vehicle fees and motor fuel taxes to other than those of State highway purposes, as diversion of these funds saddles upon the motorist an unequitable burden in the support of State Government and activities.

In the disbursement of available State highway funds Secretary Hyde placed the obligations for use in the following order: (1) debt service; (2) adequate maintenance; (3) necessary reconstruction of trunk highways; and (4) new construction.

Mr. Hyde further recommended complete transport surveys in each State with reasonable regulation and taxation of bus and truck lines and stated it was his opinion that, with the return of normal conditions, proper economic relations between railroad and highway transport would obtain.

On the afternoon of the fifteenth, the members of the association motored down the Mt. Vernon Memorial Highway and participated in the dedicatory ceremonies held at Mt. Vernon under the auspices of the United States George Washington Bicentennial Commission.

O. S. Warden, chairman of the State Highway Commission of Montana, opened the meeting on November 16, speaking on "Road Planning as Carried Forward by the State Highway Department." In reviewing the varying methods followed by different States in setting up their State road systems and State highway organizations in the early days of modern highway development, Mr. Warden drew attention to the continuous movement by which the many different procedures advanced toward the uniform methods and standards which now obtain throughout the entire nation.

IN PARTIAL CONTROL

For proper planning and highway development, Mr. Warden stressed the necessity of the control of allocation of funds being invested in the State Highway Commissions, that the work be carried on in an orderly and impartial manner for the best interests of the system as a whole. Mr. Warden expressed as his opinion that, if the same care in planning, foresight, ability and honesty had been applied to all private business in the manner that these functions are practiced by the various State Highway Departments this country would now be in a much more favorable economic condition.

He emphasized the need of further research as an aid to planning and to proper consideration of location

and construction that highways may meet the demands of the future.

Mr. Warden paid tribute to California and Oregon for their leadership in the development of low-cost, oil-treated roads which have proven such a boon to Western States with large road mileages and limited revenue. He spoke of the value of snow removal in opening communication in districts long isolated during winter months and of the development of modern snow removal equipment which has made possible this phase of highway maintenance.

ORDERLY PROCEDURE DEMANDED

Mr. Warden also emphasized the dangers of diversion of highway funds for general State purposes stating that every dollar diverted from highway purposes places in jeopardy the capital investment already made. He noted the sentiment of representatives of the United States Chamber of Commerce at the 1932 convention, held in San Francisco, and at an economic conference of intermountain States at Colorado Springs which, while voicing an insistent demand for the reduction of general taxes, demanded a continued orderly procedure of highway planning and construction as a great and wholesome policy.

Mr. Warden was followed by the Honorable Roy D. Chapin, Secretary of the United States Department of Commerce, who spoke on "The Road Users Obligations and Rights in the Financing of Highways." Secretary Chapin stated the obligation of road users in two sentences:

(1) Each should pay his fair share of cost of development.

(2) Each should use the road with due regard to the safety of all others on the highway.

As to who the road users are, Mr. Chapin pointed out that while society as a whole is dependent upon the highways for the efficacy of modern schools, hospitals, suburban development, interstate commerce, postal service and even national defense, the special interest is that of the automobile owner.

NOT TAX TARGET

Mr. Chapin laid particular stress upon the inalienable right of the man who uses the highways and who has met his obligations to demand that his vehicle shall not be singled out as a tax medium for the payment of general taxes.

In commenting upon the cry which is frequently raised for the "good old days," Mr. Chapin related his personal experience of driving the first automobile between Chicago and New York, requiring seven days to navigate the mud-bound roads of Indiana, Ohio, Pennsylvania, and New York. He doubted if anyone really desired the return of the so-called "good old days."

Grover C. Dillman, State Highway Commissioner of Michigan, then addressed the meeting on "Road Building as an Agency of Employment During Depression." Mr. Dillman enlarged upon and developed this phase of relief work, which has been touched upon by Mr. MacDonald and other speakers.

He convinced the members of the Association that the building of highways was a sound and

(Continued on page 22)

Highway and Park Departments Join In Saving Coast Areas for Public Use

By WM. E. COLBY, Chairman, California State Park Commission

IT is a truism that California's scenery and opportunities for outdoor life are among her foremost attractions. And it is equally true, on the one hand, that California's parks are rendered more valuable to the people because they are reached by splendid highways; and on the other, that California's highways are enhanced in value because they lead through and into regions of rare scenic charm such as we are preserving in our parks.



WM. E. COLBY

The interests of highways and parks are closely inter-related. This has been recognized by the California State Highway Commission, and their wholehearted cooperation in assisting in our program has been of great benefit to the Division of Parks.

Between 1928 and 1932, the number of State parks in California has increased from 10 to 32, and the area from 13,574 acres to over 67,000 acres. They represent a value of close to \$12,000,000. This rapid growth of the State Park System, made possible by the State Park Bond Issue voted in 1928, and the private and local gifts which have matched State funds, has taxed the resources made available for administering the parks and the ingenuity of its administrative offices. The bond issue made no provision for taking care of the parks after they were acquired. That was left to legislative appropriation.

UPKEEP OF ROADS

One of the very important phases of the park administration is the maintenance of roads within the parks. Fortunately it is provided by law that the State Division of Highways is charged with the upkeep of these park roads; but the wholehearted and thorough manner in which the highway authorities have carried out the provisions of the law in this respect has at once relieved

greatly the burdens of the Park Commission, and increased the value of our parks for public use.

The former toll road to summit of Mount Diablo, for instance, was impassible for long stretches during wet weather. Since it has been taken into the State Park System, it has been graded and surfaced by the Division of Highways in such excellent fashion that the trip to this spectacular peak can be enjoyed by the motorist at practically any time in the year. At the Big Basin, and in the Humboldt State Redwood Park, numerous side roads leading from the highway into the various groves and camp grounds have similarly been kept up for the use of visitors to these parks. There are many other instances in our parks.

In another important way we have enjoyed the cooperation of the Division of Highways, and that is in respect to the relocation of main highways that happen to extend through State park lands. Of necessity there is some divergence between the point of view of the engineer planning a trunk highway for the safety and convenience of the public, and the park administrator whose object is primarily to preserve the beauty of the landscape for public enjoyment. We have been fortunate in that where, for this reason, differences of opinion have arisen, it has been possible to effect a compromise satisfactory to both points of view.

FINE REDWOODS SAVED

A case in point is the new location recommended for that portion of the Redwood Highway which runs for some 7 miles through the Del Norte Coast Park. This area of 2500 acres consisting of a heavy stand of giant redwoods covering steep slopes extending to the very shore of the Pacific Ocean, is one of the most spectacular of our parks. It was because of its unique scenic qualities that private individuals, through the Save-the-Redwoods League, contributed one-half of its cost to match State bond funds.

Because of the rough and broken nature of the terrain, the present highway, built under the first highway bond issue, is narrow, crooked and hazardous for swift modern travel. The proposal to realign it according



NO LONGER PADLOCKED, Point Lobos, a scenic beauty spot of rare charm on the Carmel-San Simeon coast from which the public was barred except on payment of a fee, has been acquired as a State park and made more accessible by realignment of the State highway.



PRO BONO PUBLICO, this splendid beach and lagoon area comprising two miles of seacoast at the mouth of San Simeon Creek in San Luis Obispo County has been established as a State park through the joint efforts of the Division of Highways and the Park Commission.

to present-day standards of curvature and width implied of necessity considerable destruction of scenic values because of the many fine redwoods that would have to be sacrificed and because of the heavy cuts and fills.

Public interest, however, required a modern highway, and after many conferences and painstaking study by both the highway and the park interests, a plan was worked out for a totally different route, following

the general course of the old county road of twenty years ago, following the ridge at the eastern edge of the park, involving much less necessary destruction, as well as about half the cost of the previously proposed route, and leaving the present highway intact as a park road for more leisurely travel.

LESS COSTLY ROUTE

Thus the willingness of the Division of Highways to join with the Park Commission

(Continued on page 21)

\$100,000 Annual Participation by U. S. Approved for River Bank Protection

By **R. L. JONES**, Deputy State Engineer

AS THE result of a conference between Federal and State officials in Washington, D. C., June 27th last, approval has been given by Major General Lytle Brown, Chief of Engineers, U. S. Army, to a comprehensive program of bank protection on the Sacramento River and its tributaries, to be carried out jointly by the State and Federal governments. Attendance at the conference included General Brown; Colonel Thomas M. Robins, Division Engineer Pacific Division; Congressman C. F. Curry; State Engineer Edward Hyatt, and Chief Engineer State Reclamation Board A. M. Barton—the last two named being in Washington in connection with other matters before the War Department.

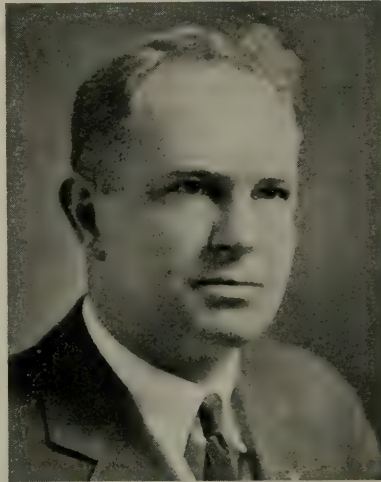
The program has for its objective the complete protection of the river banks with construction of permanent types, to be undertaken under a definite plan through a period of years until completed, as a feature of the maintenance of the Sacramento flood control project and of river navigation, and offers a final solution to the difficult, persistent and costly problem which has confronted the owners of leveed river front land since reclamation has been practiced on these rivers. The threat of breaks in the levees, always present during flood will eventually be removed to a large extent by the permanent protection of weak and exposed places.

Bank protection on the Sacramento River and its tributaries in the past has been performed by the State, through the State Engineer, and by reclamation districts and property owners. For many years the State has continuously supplied appropriations, applicable to all streams of the State, for river rectification, bank protection and related work, to be expended by the State Engineer.

STATE PAID A THIRD

The work done under these appropriations has been largely in cooperation with local interests, and in recent years the proportion of the cost paid by the State has been one-third. Since July 1, 1929, such work on the part of the State has been included in the maintenance of the flood control works of the Sacramento River flood control project, in charge of the Division of Water Resources, Department of Public Works.

Since July 1, 1910, about the time the present Sacramento River flood control project was inaugurated, the total expenditure for bank protection on the Sacramento River and its tributaries, not including the Yuba River and the by-passes, has been \$1,413,240, of which the State paid \$360,870 and local interests \$1,052,370.



R. L. JONES

During these twenty-two years the average annual expenditure has been \$64,200, of which the State paid \$16,400 and local interests \$47,800. In the seven and one-half years since January 1, 1925, the average annual expenditure for bank protection has been \$73,000, the State paying \$26,900 and local interests \$46,100.

The bank protection work done in the past by the State and local interests did not follow a definite plan and program. Funds available have always been less than the requirements, which necessitated work being done as and where required in emergency. It has been almost wholly of a temporary type, constructed of materials which have a short life, such as trees, logs, timber, brush, piles, and steel cable.

RESULTS SATISFACTORY

It may be stated in general, however, that the results obtained from the temporary types of construction have been satisfactory, except

Erosion Filling Sacramento Channels

(Continued from preceding page)

for the need to replace about half of the structures every ten years on the average. The necessity of providing protection with the cheaper and more perishable materials has failed to accomplish permanent results commensurate with the large sums of money expended.

Had it been possible in 1910 to adopt and carry forward a program such as the one now in effect, it would have been by now largely completed with the same expenditure.

During the year passed practically no cooperative bank protection has been undertaken, due to the inability of local interests to furnish their portion of the costs. Under the proposed plan the entire cost will be defrayed by the State and Federal Government in the proportion of one-third and two-thirds, respectively. Local interests will be relieved of all cost, but must furnish the necessary right-of-way. Approximately \$100,000 will be expended in the fiscal year ending June 30, 1933, and if the program is carried fully into effect \$150,000 per year thereafter.

PROPOSED PLAN

The main features of the plan are set forth in the following memorandum from the District Engineer, Sacramento, to the Division Engineer, Pacific Division, dated June 18, 1932, which was approved by the Chief of Engineers, on June 29, 1932:

"Memorandum to Lieut. Colonel Thomas M. Robins:

"1. A recent inspection of the condition of the banks and levees of the Sacramento River has been made by this office, in conjunction with the State authorities. This inspection has determined that at numerous locations the banks and levees are in need of immediate maintenance work, in order to preserve the levees, and prevent erosion and the consequent shoaling of the navigable channels.

"2. These levees are a part of the Flood Control Project (Senate Document No. 23, 69th Congress, 1st Session). This document provides that the United States assume the maintenance of all river channels, which would include bank protection to prevent erosion and consequent shoaling of the navigable channels; and that State authorities assume the maintenance of the levees. The document estimates the maintenance assumed by the United States at \$100,000 per annum.

"3. To date no appropriation for this maintenance has been made by the United States. The State of California has appropriated annually \$100,000 for all maintenance work connected with their share of the Flood Control Project, of which a certain portion is devoted to levee maintenance. This has amounted to about \$26,000 per annum by the State supplemented by about \$46,000 per annum contributed by local interests. Due to the small amount available for bank revetment, the majority of it done is of the emergency type and of an impermanent nature, consisting mostly of brush mats, retards, brush piles and other miscellaneous temporary types. Most of this work has been done at places where local authorities would contribute two-thirds of the necessary funds, and there has been no general plan of bank revetment ever adopted.

"4. Bank and levee maintenance pertains both to the State and the government. The former from the

point of view of maintenance of levees, with which they are charged by the Flood Control Act, and the latter from the point of view of protection of the navigable channels from bank erosion for which it is responsible. If maintenance funds are not provided for by the government in the near future, it is feared the erosion will assume serious proportions, necessitating much expenditure of funds by the government in the future.

"5. The inspection of the Sacramento and Feather rivers recently made indicates there is need of bank revetment at present as follows:

Sacramento River above Colusa.....	6,500 feet
Sacramento River, Colusa to Sacramento	21,500 feet
Sacramento River, Sacramento to Cache Slough	62,000 feet
Feather River.....	4,000 feet
	<hr/> 94,000 feet

Below Cache Slough the necessary shore protection is definitely provided for by the present Flood Control Act.

It was found that bank protection was urgently needed for the following distances. These are included in the 94,000 feet indicated above.

Sacramento River above Colusa.....	2,100 feet
Sacramento River, Colusa to Sacramento	5,700 feet
Sacramento River, Sacramento to Cache Slough	8,200 feet
	<hr/> 16,000 feet

"6. Costs and methods of construction of various types of bank revetment have been investigated in conjunction with the State authorities. It was decided that a permanent type of bank revetment was advisable (rip-rap, concrete slab or others) and that such types could be placed at an average cost of about \$18 a linear foot. Based on the above estimates, the amount needed for immediate construction would be \$288,000, and for the complete program \$1,692,000. There will of course be a certain maintenance charge against this permanent bank revetment. It is estimated this will amount to a total of \$50,000 over a period of ten years.

STATE PARTICIPATION

"7. The State authorities have informally stated, that in case the government would provide funds for permanent maintenance work as outlined above, that they could possibly divert \$10,000 for the fiscal year 1933 for such work. As their funds are all allocated for this period, it will be impossible to divert more until the next session of the Legislature. They have also indicated that if the government will allot funds annually, that they will ask for a much larger sum for succeeding fiscal years from the State Legislature. No specific sum has been mentioned.

"8. In view of the fact that the Flood Control Act evidently provided for maintenance work of this description, though no appropriation has ever been made; that such work is urgently needed at present;

(Continued on page 24)

Eight Major Projects Estimated to Cost \$1,359,100 Advertised for Bids

C. H. PURCELL, State Highway Engineer and Chief of the Division of Highways, reported to Director Earl Lee Kelly of the Department of Public Works that during the month of December bids were called for the construction of eight major highway projects, estimated to cost approximately \$1,359,100. Six of the projects involve road construction on 26.2 miles of State highway and two projects call for the construction of three bridges on State routes.

Progress by the Division of Highways in taking advantage of Federal aid funds provided by the Emergency Relief and Construction Act, which was passed by Congress last July is evidenced by the fact that six of the eight projects advertised in December are emergency relief jobs.

California was apportioned \$4,667,000 of the \$120,000,000 provided by the act and this State will collect approximately \$3,500,000 Federal funds on contracts now under way and it is estimated that another \$1,000,000 will be collected on the six Federal aid projects advertised during December making a total of nearly \$4,500,000 in Federal emergency funds obligated to California by December 31st.

BIG COAST PROJECT

The following brief descriptions of the more important projects included in the December advertising provide some conception of the extent of the work which was set in motion by the Division of Highways during the month just past.

The largest project advertised in December provides for the grading and paving of 4.1 miles of the Oxnard-Serra Highway along the coast north of Santa Monica. This work is a unit in the reconstruction of sections of this route to standards adequate for the large volume of traffic using this State road which lies between the foot of the high bluffs and the ocean beach.

The improvement will consist of placing a 40-foot pavement and grading and oiling shoulders on each side of the pavement for the full width of the 80-foot right of way. These wide shoulders will provide ample parking

area for the large crowds who seek recreation along the beach. Construction of a bridge across Topanga Creek which is within the limits of this project is now under way.

WIDENING ARTERIAL

At the northerly end of the new Ridge Route Alternate which is now being paved, a project covering the 3.8 miles between Gorman and the northerly boundary of Los Angeles County is to be reconstructed with a 30-foot pavement on a 46-foot graded roadbed.

This improvement will bring this section of State highway to modern standards of grade and alignment and its completion, together with the completion of the two paving contracts now under way on the alternate route over the ridge, will provide motorists traveling this main arterial of the State highway system with a new 30-foot pavement from Castaic School to the Kern County line.

Five miles of the Coast Route in Monterey County, which extends from a point six miles south of San Ardo to one mile south of San Ardo, is to be reconstructed to modern standards of grade and alignment. This work is a unit in the general reconstruction program of this important and heavily traveled arterial which connects the metropolitan areas of Los Angeles and San Francisco.

CURVES ELIMINATED

The extent of the improvement is shown by the reduction of the number of curves from 34 on the existing alignment to 6 on the revised line and the reduction of the maximum grade from 6 per cent to 4.5 per cent. The new road will provide a 20-foot pavement with 8-foot shoulders on each side of the pavement.

An improvement of much interest to the many motorists who use the Owens Valley road between Mojave and Bishop on the east side of the Sierra is the construction of a graded roadbed 38 feet wide with selected surfacing on the full width of the roadbed and with a bituminous treatment applied to the central 22 feet over 6.3 miles between Keough Hot Springs and Bishop. This improvement will be placed on a new location which lies to the west of the existing highway

(Continued on page 22)

Work Put Under Way in December

The Division of Highways during the month of December advertised eight major highway projects, including three bridges. The projects are located in six counties. They involve road jobs totaling 26.2 miles and the construction of three bridges. In the list are six projects to be financed with the aid of Federal Emergency Relief funds.

DETAILED LIST OF PROJECTS

County	Location	Route	Miles	Type
*Monterey-----	6 miles to 1 mile south of San Ardo	Coast Route-----	4.9	Pavement
*Los Angeles-----	Las Flores Canyon to Santa Ynez Canyon	Oxnard-Serra Highway-----	4.1	Pavement
*Los Angeles-----	Gorman to North- erly Boundary	Los Angeles-Sacra- mento Arterial----	3.8	Pavement
*Los Angeles-----	Oaks to Vasquez Rock Road	Los Angeles-Mojave Road-----	1.5	Pavement
*Inyo-----	Keough Hot Springs to Bishop	Owens Valley- Tahoe Road-----	6.3	Bit. Tr. Cr. Rock Surfacing
Ventura-----	Santa Paula to Wells Road	Ventura-Castaic Lateral-----	5.6	Bit. Surf. Tr.
San Diego-----	Across Cudahy Channel & Tecolote Creek	Coast Route-----	2	Reinf. Conc. Grid. Bridges
*San Bernardino----	Across Mojave River at Barstow	Mojave-Barstow Road and Bar- stow-Jean Road-----		745' deck plate gir. and steel str. Bridge

*Federal Emergency Relief Fund Project.

SUMMARY

Type	Miles	Amount
Permanent Type of Pavement-----	14.3	\$1,068,700
Bituminous Treated Surfacing-----	11.9	119,000
Bridges -----	(3)	171,400
Total -----		\$1,359,100

Piru Creek Forced to 'Zoom' 60 Feet Out of New Channel

(Continued from page 4)

in low places to make a uniformly smooth surface.

The design of the outlet end of the concrete lined channel required a considerable amount of careful study. With the high velocity attained by the water in the channel, there would be a tendency to undercut the concrete channel paving and wingwalls unless some method were provided of dissipating the force of the water.

Studies were made of other channels and the methods used in controlling the undercutting action of the water. Much valuable information was obtained from the results of a series of model tests made at the Alden Hydraulic Laboratory of the Worcester Polytechnic Institute, where a model channel was built to scale with one side built of glass in order to better observe the action of the water. Several types of outlets were tested there and the effects on the erosion of the channel noted.

PROVED BY MODEL

The type which gave the best result consisted of an outlet which deflected the water upward at an angle of about $12\frac{1}{2}$ degrees. This type produced no appreciable erosion for a distance of 60 feet from the end of the channel. When used on an actual dam spillway, the results were almost exactly as predicted from model experiments.

The outlet end of the Piru Creek Channel Change was designed with these results in mind. A heavy cutoff wall was constructed at the end of the concrete lining with a heavy flaring wingwall on each side. The space at the bottoms of the walls was filled with heavy boulders. In addition, three groynes of boulders were constructed at approximately right angles to each wingwall and extending out into the stream to break the back eddy of the water.

It is expected that the fast moving water on approaching the outlet end of the concrete-lined channel will be deflected upward and literally pitched for a distance of 60 feet from the mouth of the channel. Much of its energy will be dissipated in this process and any erosive action will be at such a distance below the concrete work as not to undercut or endanger it.

Highway Relief Work Dollar Spreading to 50,000 Californians

(Continued from page 2)

did cooperation of the various welfare organizations throughout the State, mayors of the various towns, American Legion Posts, and members of the Legislature, all of whom have given of their time and money to aid in selecting the most worthy ones in order that the most good for the most people could be secured through expenditure of these funds. We want to acknowledge with our sincere appreciation this splendid cooperation.

During the winter of 1931-32 the Department expended \$2,266,070 on maintenance crew work, which was divided into three-day-a-week jobs. This appropriation provided employment for 5493 heads of families where the average family consisted of three dependents making a grand total of 21,972 people aided directly by this work.

Of course, this aid also extended, as it does today, to the merchants and people furnishing means of shelter, clothing and subsistence to this total population.

In our Federal Aid projects for which we have been apportioned \$4,667,700 out of the \$120,000,000 provided for by the Emergency Relief and Construction Act of Congress of last July, the unskilled labor has been secured through the local relief and employment agencies in the locality where the project is being constructed.

Effect of Speeding on Gasoline Mileage

WITH a Federal tax added to the State tax on gasoline, motorists will find much of interest in studies recently made relative to gasoline consumption of cars at different speeds.

According to the findings of carburetor experts, a gallon of gasoline which gives 20 miles to a gallon at a speed of 20 miles an hour may deliver only seven miles at 70 miles an hour.

At speeds from 20 to 40 miles an hour the decrease in mileage is only two miles, but grows rapidly at higher speeds.

At 50 tests showed 15 miles per gallon and 12.6 at 60.

Facsimile of a
unique New Years'
Greeting engrossed
on Parchment
Received by Director
Earl Lee Kelly



Rank and File
of Division VII
join in sending
Best wishes and
a pledge of
Loyal Cooperation

WHEREAS, EARL LEE KELLY, Director of the Department of Public Works, State of California, will enter the New Year facing the most difficult problems in the history of the Department of Public Works, and

WHEREAS, We, the undersigned employees of District VII, Division of Highways, Department of Public Works, realize that many trials and tribulations will confront the Director of the Department of Public Works during the year,

THEREFORE, we take this opportunity of extending our best wishes for the New Year to

EARL LEE KELLY

our Director, and pledge to him our loyal cooperation.

Subscribed to at Los Angeles, California, this 30th day
of December, 1932.

St. Cortez
John C. More
Ralph C. Myers
A. D. Griffin
R. L. Thomas.
A. N. George
Earl T. Scott
H. F. Allen
O. B. Black
E. C. Cunningham
E. E. Belford
Robert R. Blumharg
Ralph E. Dacker
Fred P. Merrick
Joseph Halpern
Ernest R. Scott
Francis E. Altengen
Rafael L. Verdugo
C. W. Coffin
A. B. Edwards
M. L. Bauders

Adolph M. Lutho
D. L. Voorhees
Louis Felix
H. B. Zike
F. W. Pettit
W. O. Heyne.
H. S. Throckmorton
C. F. Wagner.
L. Ann Weeson
Lais Anne Stuart
Georgina Dunbar
Elizabeth A. Alexander
Eden Johnston
Ruth F. Kline
Lalia Athery
Dorah Kironer
Marie Dahlmann
Frances Sigman
E. M. MacDonald.
S. C. McCulloch
E. B. Currey

Charles Jones.
Mortimer A. Clark
Warren B. James
Mary F. Donnelly
W. H. Johnson
V. R. Tarnwater
Horton Whipple
Eula C. Jacob
Marion Taylor
M. J. Backlund
Elyse B. Dane
Theresa Patterson
Edith Lloyd
Victor V. Henderson
Ralph L. Kinsey
H. M. Fenwick.
Samuel Olman
Frank C. Halpern
A. J. Astorian
Claret H. Parker
Henry Hawthorne

Two hundred and eighty seven district employees in the field, whose signatures could not be obtained because of lack of time, concur in the above sentiment.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY-----Director
JOHN W. HOWE-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 11 JAN.-FEB., 1933 Nos. 1-2

SELF-SUPPORTING

It isn't all outgo when the motorist pays his license fee and gasoline tax.

Authoritative statements from various state highway departments say that the motorist comes out on the long end of the deal. The building of improved roads, it is shown, reduces car operating costs and from that one point alone the motorist gets back more than he pays out.

The state highway commission of Missouri fathers the statement that the average motorist in that state is saved \$30 a year over and above his license fee and gas tax payments. On that basis the roads on the Missouri state system, which includes 3,100 miles of concrete, are returning \$22,500,000 a year to the state's road users.

Although California is humorously thought of as a state of somewhat extravagant claims, there is no exaggeration in the state's announcement that her good highways, up to the middle of 1930, saved \$54,000,000 to motorists.

California's state highway department calculates per mile savings in car operating costs over improved roads on a very conservative basis, and then cuts the whole total in two.

Frank T. Sheets, chief engineer of the Illinois State Highway Department, relates that Illinois' state highway system, nearly all concrete paved, reduces car operating costs \$73,000,000 a year. This is \$25,000,000 more than motor car users pay out in taxes.

Such facts as these compose irrefutable evidence that highways are self-supporting, road authorities claim. The large savings due to good roads lift highways out of the class of most government activities.—South Dakota Highway Magazine.

How Labor Gets 91% of Every \$1,000 Paid for Concrete Roads

THE following testimony by T. H. MacDonald, Chief, U. S. Bureau of Public Roads covers the distribution of \$1,000 paid for concrete highway and shows the approximate total amount which reaches the wage earner.

	Wages
Contractor receives \$1,000, of which direct construction receives -----	\$ 141.00
Contractor's \$859 remaining is distributed as follows:	
\$184 for getting onto job, equipment, bonds and insurance, gross profits, etc., of which direct labor receives -----	44.70
And \$675 to mills and quarries of which direct labor receives -----	117.00
The \$697.30 remaining (\$139.30 from contractor and \$558.00 from mills and quarries) after this distribution, is spent as follows:	
Freight eventually receives \$406.70 of which direct labor receives -----	175.00
Fuel eventually receives \$57.20, of which direct labor receives -----	38.00
Repairs and depreciation eventually receives \$188.75, of which direct labor receives -----	56.00
Materials and supplies eventually receive \$170.80, of which direct labor receives -----	157.65
Taxes and redistribution items eventually equal \$49.50, of which direct labor receives -----	40.60
Profits, interest, rents and depletion eventually equals \$209.15, of which direct labor receives -----	139.15
Labor eventually receives 91 per cent or ----	\$ 910.00
Owners expend -----	90.00
	\$1,000.00

NOTE: This table is made up by breaking down the original \$1,000 to each of the major items of expenditure.

It will be noted that the sums eventually received by freight, fuel, repairs and depreciation, materials and supplies, etc., exceed the \$859 left after labor is paid by the contractor. This is due to the redistribution of this money to its final destiny and is not broken up into its final parts each time. For example, freight eventually receives \$406.70, almost half the road dollar, and this is distributed as follows: Labor, \$175.00; material and supplies, \$40.00; fuel, \$21.70; interest, \$47.60; taxes, \$25.60; repairs and depreciations, \$53.50 and profit, \$42.60.—South Dakota Highway Magazine.

Heard about the fellow who got his car back from the auto laundry with the horn button missing?

Two Miles of Ocean Front Obtained for State Public Park

(Continued from page 13)

in looking upon all sides of this important question has resulted, I believe, to our mutual benefit, for the new highway will cost much less than that originally projected, and we shall be able to retain unchanged the picturesque features of the present road.

I might mention many instances of similar cooperation in working out highway realignment in State parks, notable among them being the new highways at Point Lobos in Monterey County and Mission Bay in San Diego County.

Probably more important than any other phase of the joint effort of the Park and Highway divisions is their accomplishment in pooling resources in a number of instances so as to acquire lands of considerable park value along newly constructed highways.

One of the primary issues in the campaign for the State Park Bonds in 1928 was the preservation for the citizens of California of an adequate percentage of her seacoast. It was pointed out that with close to a thousand miles of ocean frontage in California only a very small percentage was assured of being forever accessible to the public.

PRESERVED FOR PUBLIC

But essential acquisitions have been made by the State Park Commission, with the aid of bond fund money matched by local communities or private individuals, and one of the most satisfactory projects which has been carried out involves two miles of ocean front, including several excellent beaches between Cambria Pines and the mouth of San Simeon Creek on the new Carmel-San Simeon Highway.

It was due to the enterprise of the Division of Highways that when the new right of way was acquired for these two miles at the same time options were obtained on behalf of the Division of Parks for the land lying between the highway right of way and the mean high tide line of the Pacific Ocean. Through the generosity of two of the owners through whose property the new highway ran, Mr. William Randolph Hearst and Mr. Vine Van Gorden, tracts of land were donated to the State for park purposes and matched with State Park bond money to acquire the remainder of the two-mile strip.

Snow Removal Pays Dividends in Large Savings to Motorists

(Continued from page 6)

being performed only in their spring opening.

State Route No.	Location	Mileage
1	Ukiah to Oregon Line (Portions).....	106.1
3	Redding to Oregon Line (Portions).....	126.1
4	Saugus to Grapevine.....	67.8
11	Placerville to Meyers.....	63.9
12	Guatay to Boulevard.....	100.0
13	Pooleys to Long Barn.....	32.2
15	Rough and Ready to Washington Road.....	22.6
17	Auburn to Nevada City.....	21.0
18	Cathay to Yosemite Park.....	30.0
20	Redding to Blue Lake (Portions).....	103.0
21	Oroville to Beckwith Pass.....	166.1
23	Saugus to Woodfords (Portions).....	104.6
24	Angels Camp to Ebbetts Pass.....	56.1
25	Nevada City to Downieville.....	42.3
28	Redding to Alturas and Nevada State Line.....	188.6
29	Red Bluff to Susanville and Nevada State Line.....	176.4
31	San Bernardino to Barstow.....	35.0
34	Pine Grove to Carson Pass (Portions)....	32.3
35	Peanut to Kuntz.....	29.0
37	Colfax to Truckee.....	70.5
38	Meyers to State Line at Verdi.....	65.4
39	Tahoe City to Brockway.....	11.1
40	Chinese Camp to Yosemite Park (Portions).....	31.1
41	General Grant Park.....	25.0
43	San Bernardino to Fawnskin.....	45.7
46	Weitchpec to Happy Camp.....	75.0
49	Calistoga to Middletown.....	8.0
57	Walker Pass.....	8.4
58	Arvin Road to Mojave (Portions).....	39.9
65	Coloma to Placerville.....	20.8
72	Weed to Oregon State Line at Calor.....	63.1
73	Alturas to Oregon State Line at New Pine.....	38.6
76	Bishop to Nevada State Line.....	41.3
TOTAL MILEAGE.....		2047.0

Thus, instead of being subject to subdivision of doubtful landscape value or being fenced off entirely from the public, this two-mile strip will remain as a part of the California State Park System with ever increasing scenic and recreational possibilities when the new route is completed between San Francisco and Los Angeles.

As chairman of the California State Park Commission and speaking for that body as a whole, I am glad of the opportunity to tell of some of these examples of joint action by the Divisions of Highways and Parks to the great present and future benefit of the citizens of California.

Relief Work a Bulwark Against Dole

(Continued from page 11)

able means of levelling off the hollow of the depression and that it was a bulwark against a direct dole, with the attendant demoralization which continued charity produces, and everything considered, highway construction and maintenance as a form of unemployment relief returns full value for the investment.

Mr. Dillman produced statistics to show that for every man employed in highway construction, two more are employed in the production and transportation of materials and equipment and that for every \$350 expended on road work one man is directly employed for one month and two more indirectly employed for a similar period.

SECRETARY WILBUR SPEAKS

On the afternoon of November 16th the meeting was addressed by the Honorable Ray Lyman Wilbur, Secretary of the United States Department of the Interior. Dr. Wilbur spoke on the necessity of highway beautification and the development of roads in national parks and monuments that they might be more accessible to the motoring public. Dr. Wilbur stated that between forty and fifty millions of people, equal to nearly half the population of the United States, visit these parks and monuments yearly, which seems to be a preponderance of evidence that the citizens of this nation are alive to natural beauty and fully expect the development of highways to carry them to these spots of recreation.

Following Dr. Wilbur, Henry G. Shirley, State Highway Commissioner from Virginia, spoke on "Federal and State Highway Expenditures as part of Government Obligations." Mr. Shirley emphasized the responsibility of governmental bodies for development within the confines of their commonwealths and of the necessity of adequate transportation facilities for the furtherance of that development.

On the morning of the 17th the association met in business session and Frederic E. Everett, State High-

way Commissioner from New Hampshire and president of the association presided and delivered his address. Mr. Everett reviewed the addresses which had been given and briefly summarized the achievements of highway advancement in the United States during the past year.

In summarizing the trend of opinion as expressed during this eighteenth annual meeting of the American Association of State Highway Officials two features seem to stand out in bold relief.

TREND OF OPINION

First: The danger of extending State highway systems beyond the capacity of revenues required for maintenance, reconstruction and new construction.

Second: Providing unemployment relief during periods of depression by highway construction is an admirable means of reestablishing confidence and results in the increase of the capital investment of the most valuable asset to the State and nation.

In all probability the most important feature of the activities of this association is the work of the various committees on maintenance, construction and design. Sessions of these committees were held on the evening of the 16th. It is the presentation of facts resulting from research and study of design, and methods and discussion pertaining to them in the committee sessions which is the vitalizing factor of the association.

The free interchange of knowledge, through these committees, by the various State highway departments has engendered a degree of confidence and cooperation within the organization which has made possible the coordinated uniformity of highway development which now obtains throughout the nation. The experience of each State has been made available to the other States, therein avoiding the waste of duplicated trial and error.

EIGHT MAJOR PROJECTS ADVERTISED FOR BIDS

(Continued from page 16)

on higher ground affording better subgrade drainage. The new alignment will be a great improvement over the existing crooked road.

At Barstow in San Bernardino County a 745-foot deck plate girder and steel stringer bridge on concrete piers and abutments is to be constructed across the Mojave River. The structure will be located at the northerly entrance of the State highway to Barstow and will serve traffic using both the Mojave-Barstow-Needles highway and the interstate highway between Barstow and Jean, Nevada.

This new and modern bridge will have a

concrete deck and will provide a clear roadway 24 feet wide with two 3-foot sidewalks. It will replace the old steel truss and timber trestle, with its narrow 17-foot roadway, which has served traffic at this river crossing since the old days when twenty-mule freighters trudged the sandy tracks of the great Mojave desert.

A GOOD SHOT

The Irish night watchman at the observatory was new. He paused to watch a man peering through a large telescope. Just then a star fell.

"Man alive," he exclaimed with amazement, "you're shure a foine shot."—*Tennessee Road Builder.*

"Doctor, can't something be done about my husband talking in his sleep? It's all so indistinct!"—*Life.*

Bids and Awards on Highway Projects Made in December

KERN COUNTY—13 span timber bridge across Walker Creek. District VI, Route 58, Section D. Fred W. Nighbert, Bakersfield, \$13,676; Lynch Cannon Engineering Co., Los Angeles, \$12,731; Paul Opperman, Bakersfield, \$14,436; Herbert Baruch Corporation, Ltd., and Robinson-Roberts Co., Los Angeles, \$13,913; M. B. McGowan, Inc., San Francisco, \$13,689; R. R. Bishop, Long Beach, \$12,258; Hartman Construction Co., and G. A. Graham, Bakersfield, \$12,070; Lindgren & Swinerton, San Francisco, \$12,808; Stroud Bros. and Seabrook, Bakersfield, \$12,186. Contract awarded to Carl Ingalls, Inc., Bakersfield, \$11,767.

KERN COUNTY—11 span timber bridge across Caliente Creek. District VI, Route 58, Section D. Fred W. Nighbert, Bakersfield, \$12,380; Lynch Cannon Engineering Co., Los Angeles, \$11,663; Paul Opperman, Bakersfield, \$13,315; Herbert Baruch Corporation, Ltd., and Robinson-Roberts Co., Los Angeles, \$12,845; M. B. McGowan, Inc., San Francisco, \$12,546; R. R. Bishop, Long Beach, \$11,206; Hartman Construction Co., and G. A. Graham, Bakersfield, \$10,969; Lindgren & Swinerton, Inc., San Francisco, \$11,618; Stroud Bros., and Seabrook, Bakersfield, \$10,822. Contract awarded to Carl Ingalls, Inc., Bakersfield, \$10,822.

LOS ANGELES COUNTY—Between Tujunga and La Canada, about 4.0 miles to be graded and paved with asphalt concrete. District VII, Route 9, Section A. Southern California Roads Co., Los Angeles, \$177,193.50; Oswald Bros., Los Angeles, \$139,184; Southwest Paving Co., Los Angeles, \$147,903; Hall-Johnson Co., Alhambra, \$178,713.50; George R. Curtis Paving Co., Los Angeles, \$151,570.65. Contract awarded to Griffith Co., Los Angeles, \$138,846.

LOS ANGELES COUNTY—Between Santa Ynez Canyon and Santa Monica Canyon about 1.5 miles slopes to be excavated. District VII, Route 60, Section B. Von der Hellen & Pierson, Castaic, \$103,323; M. S. Ross, Los Angeles, \$123,894; Guy F. Atkinson Co., San Francisco, \$132,934; S. N. Palmer & J. P. Holland, Inc., San Francisco, \$119,251; Herbert M. Baruch Corp., Los Angeles, \$133,160; Weymouth Crowell Co., and E. Penn Watson, Jr., Los Angeles, \$130,273; Merrill-Chapman & Scott, \$110,114; Griffith Co., Los Angeles, \$109,104. Contract awarded to C. G. Willis & Sons, Inc., Los Angeles, \$102,076.

LOS ANGELES-ORANGE COUNTIES—Between Long Beach and Seal Beach, 1.3 miles of existing roadbed to be resurfaced. District VII, Route 60, Section F-A. Sully-Miller Contracting Co., Long Beach, \$2,596; H. E. Cox & Son, Pasadena, \$3,681; Sanders Pearson, Santa Monica, \$3,776. Contract awarded to Griffith Company, Los Angeles, \$2,421.

LOS ANGELES COUNTY—Between Encino and Girard, about 0.3 mile of guard rail to be installed. District VII, Route 2, Section B. George Tennyson, Alhambra, \$1,288; Joseph Maiser, Los Angeles, \$1,339; D. A. Loomis, Glendale, \$1,365; Kovacevich & Price, Inc., South Gate, \$1,494; R. A. Wattson, Los Angeles, \$1,545; J. B. McIntosh, Glendale, \$1,663; Contracting Engineers, Inc., Los Angeles, \$1,674; W. J. Distell, Los Angeles, \$1,764; Chas. Booth & Perry Tomer, Los Angeles, \$1,803; H. E. Cox & Son, Pasadena, \$1,983. Contract awarded to Raymond H. Liggett, Lynwood, \$1,223.60.

LOS ANGELES COUNTY—Erection and completion of maintenance station buildings near Glendora. District VII. Wigg Construction Co., Redondo Beach, \$1,662; Wm. J. Esser, Long Beach, \$1,980; S. & W. Const. Co., (Streiff & Witt), Los Angeles, \$2,143; R. Royden Hopper, Arcadia, \$2,144; Joseph Maiser, Los Angeles, \$2,147; Jacobson & Jacobson, Los Angeles, \$2,167; W. O. Moamaw, La Verne, \$2,169; J. B. McIntosh, Glendale, \$2,230; Contracting Engineers, Inc., Los Angeles, \$2,269; John Strona, Pomona, \$2,371. Contract awarded to George Krivic, Los Angeles, \$1,456.

MERCED COUNTY—Between Merced and Merced Airport, about 0.6 mile to be graded and paved with Portland cement concrete. District VI, Route 4, Section C. A. J. Raisch, San Jose, \$23,999; Valley Paving & Construction Co., Fresno, \$31,397; Bundeson & Lauritzen and Delta Dredging Co., Pittsburg, \$36,928; D. McDonald & N. M. Ball, Sacramento, \$31,246; M. J. Bevanda, Stockton, \$36,739; United Concrete Pipe Corporation, Los Angeles, \$29,470. Contract awarded to Clyde W. Wood, Stockton, \$28,409.

HERE'S CHEER FOR ROAD CREW'S WORK IN A STORM

"Mr. Earl Lee Kelly, Director,
Department of Public Works,
Sacramento, California.

Dear Mr. Kelly:

On a recent evening Mrs. Smith and myself accompanied by two friends left the Hotel Alexandria enroute home, as we had to be on the job next morning. It would be entirely remiss if I did not drop you this short letter to tell you how well your road crews were performing at Castaic on one end of the ridge to just above the Grapevine on this side.

As you know we have been over this piece of highway many times, but you had a real problem that evening, and this letter is just a word of thanks to you and your men in keeping this highway open and traffic moving under stressing conditions of rain, sleet, snow and fog and excessive cold.

I particularly stopped and looked at one of your plows, in fact all of your equipment and men were moving like they knew what they were doing.

With kindest regards.

Cordially and hospitably,

(Signed) CLAYTON V. SMITH.

Executive Vice President, The Hamilton Chain
of Hotels—Headquarters: Hotel Fresno."

She Knew Him

Bump—Has your wife learned to drive the car yet?
Bumper—Yes, in an advisory capacity.

Son—"What does the word 'chauffeur' mean?"

Father—"That is the name given to the driver of a motor car."

Son (after a moment's thought)—"That was not the name you gave to the driver of the car that nearly ran over you yesterday."—*National Motorist*.

MONO COUNTY—Between Whiskey Creek and Convict Creek, about 4.3 miles to be graded and surfaced with bituminous treated crushed gravel or stone. District IX, Route 23, Sections C. D. U. B. Lee, San Leandro, \$68,815.60. Contract awarded to Southwest Paving Co., Los Angeles, \$51,591.30.

TEHAMA COUNTY—Between Southerly Boundary and Corning, about 8.9 miles to be graded and paved with asphalt concrete. District II, Route 7, Section A. California Construction Co., and D. McDonald, San Francisco, \$136,446; A. Teichert & Son, Inc., Sacramento, \$137,280; Peninsula Paving Co., San Francisco, \$147,166; Clark & Henery Construction Co., San Francisco, \$151,765; Granite Construction Company, Ltd., Watsonville, \$168,660; J. R. Reeves and Lord & Bishop, Sacramento, \$159,203; Hemstreet & Bell, Marysville, \$152,685; M. J. Bevanda, Stockton, \$139,164; Union Paving Co., San Francisco, \$142,550. Contract awarded to Hanrahan Company, San Francisco, \$129,805.50.

VENTURA COUNTY—Between Santa Clara River and Ventura, about 4 miles to be graded and paved with Portland cement concrete. District VII, Route 2, Section C. Sander Pearson, Santa Monica, \$113,587.50; E. H. Bashaw, North Hollywood, \$107,301; J. L. McClain, Los Angeles, \$105,459.50; Griffith Co., Los Angeles, \$101,892.50; United Concrete Pipe Corporation, Los Angeles, \$104,706.22; M. J. Bevanda, Stockton, \$102,671. Contract awarded to Kovacevich & Price, Inc., Southgate, \$96,469.

Program for River Bank Construction

(Continued from page 15)

and that the State has indicated its willingness to furnish certain funds for this work, I recommend, provided the State makes available these funds, that:

(1) The government make available funds not to exceed \$100,000 a year for this work.

(2) All work be done under the supervision of the California Debris Commission.

(3) That only work of a permanent nature be installed.

(4) The proportion of government funds to State funds expended be in the proportion of 2 to 1.

(5) Any necessary rights-of-way to be furnished by State authorities.

"9. No further appropriation will be needed to provide this \$100,000 per annum as long as the present Flood Control Appropriation of \$1,000,000 per annum is continued, due to the fact that the project is costing less than originally estimated. The recommendation that the State pay only one-third of the work is based on the facts that that proportion of funds will be spent on the work below the high water line, and, therefore, chiefly for channel protection, and that the State has spent large sums on this work, while the government has appropriated nothing to date.

CHIEF APPROVES

"10. In the event the above recommendations are approved, a complete plan for the revetment of the river will be drawn up, including detailed costs and types of revetment to be used. A memorandum from the Department of Public Works, Division of Water Resources, giving details as to the State's work in this connection in the past is attached herewith.

J. G. DRINKWATER,
Captain, Corps of Engineers,
District Engineer.

FIRST INDORSEMENT

Washington, D. C., June 29, 1932—To the Chief of Engineers:

"Recommending approval of the procedure outlined by the district engineer in paragraph 8 of the above memorandum, with the understanding that the State of California will be able to contribute only \$10,000 towards the work in question for the fiscal year 1933, but undertakes thereafter to contribute \$50,000 per year; all as agreed upon at a conference with the Chief of Engineers on June 27, 1932, by Congressman Curry, Mr. Hyatt, State Engineer, and Major Barton, Chief Engineer, State Reclamation Board.

THOMAS M. ROBINS,
Lieut. Col., Corps of Engineers,
Division Engineer, Pacific Division."

Approved June 29, 1932.

Lytle Brown, Major General,
Chief of Engineers.

The following program of construction covering bank maintenance on the Sacramento River for the

fiscal year ending 1933 has been approved by the California Debris Commission:

- (1) Chicory Bend, District 900, left, Mile 53.5, 1500 feet.
- (2) District 730, Rosebury, right, Mile 84.3, 400 feet.
- (3) District 730, Russell, right, Mile 85.0, 400 feet.
- (4) Girdner Bend, District 70, left, Mile 126.3, 700 feet.
- (5) Below Moulton weir, left, Mile 158.5, 200 feet.
- (6) Portuguese Bend, District 744, left, Mile 44.0, 1000 feet.
- (7) District 307, right, Mile 43.0, 300 feet.
- (8) Tyndall Mound, District 108, right, Mile 102, 700 feet.
- (9) Ministerial Bend, District 1500, left, Mile 104.5, 500 feet.
- (10) Near Taylor Monument, right, Mile 67.0, 100 feet.
- (11) Above Glide, Landing, District 900, right, Mile 51.3, 400 feet.
- (12) Three Mile Slough, Sherman Island side, 300 feet.
- (13) Riverview Station, District 755, right, Mile 49.5, 200 feet.
- (14) Nelson warehouse, District 108, right, Mile 125.0, 100 feet.

It is estimated that the above program can be carried out this fiscal year at a cost of \$100,000, including \$10,000 of State funds, which will be expended by the State to provide the bank maintenance necessary at Tyndall Mound, item (8), length 700 feet.

The work to be done under this program in the present fiscal year is now well under way, the California Debris Commission being engaged in constructing the works designated items (1), (2), (3), (6) and (11) above, and the portion of the work to be done by the State to cost \$10,000, item (8), protection at Tyndall Mound, is now being done by the Division of Water Resources under charge of the writer.

During the period required to carry out the complete program, it will be necessary for the State to continue to perform emergency work of a temporary nature and to maintain existing protection in cooperation with other agencies, as a part of the maintenance of the flood control project. This period will be at least ten years, and the need for funds for this purpose will be greatest at the outset, gradually diminishing as the permanent program progresses.

His Lucky Day

The electricians were making some repairs on the local school.

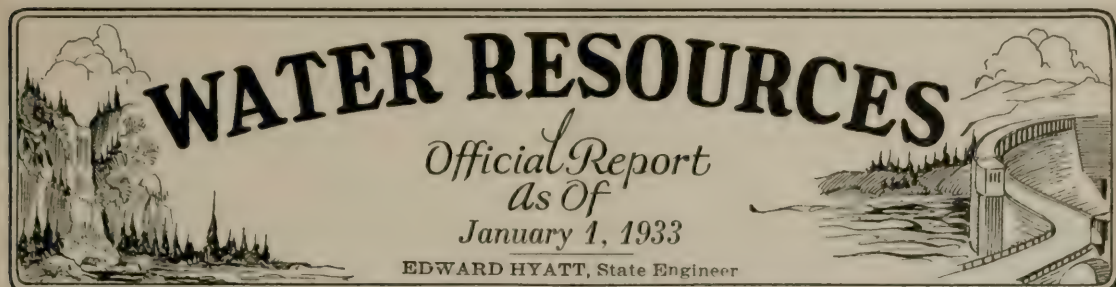
Schoolboy: "What are you doing, mister?"

Electrician: "Installing an electric switch."

Boy: "Well, I don't care. Our family is moving today, and I won't be going to this school any more."

—Answers.

When you are asked to pass judgment on your wife's new dress, be sure your criticism is perfectly candied.—*Union Oil Bulletin.*



The announcement that a method has been found for ending the salinity problem of the Sacramento-San Joaquin Delta by control of stream flow, and the further important news that a new agreement has been made with the Federal Government for construction of the All-American canal from the Colorado River in Imperial County at a reduced cost estimate, are two features of the December report of State Engineer Edward Hyatt covering the activities of the Division of Water Resources. The report, including details of flood control and reclamation projects, snow surveys, dam repairs and water application is as follows:

One of the conditions required to make effective the contract between the United States and the Imperial Irrigation District for the construction of the All-American Canal from the Colorado River was that there should be included within the boundaries of the district substantially all of the lands that could be served by the canal. The district accepted the contract in an election held February 11, 1932, but subsequently found it impossible to meet the inclusion condition, particularly with reference to the lands in Coachella Valley and adjacent areas. These lands are mostly included in the Coachella Valley County Water District and apparently the owners prefer to act independently under their own organization.

This situation has resulted in a new contract between the United States and the Imperial Irrigation District, under which the inclusion of new lands, with the exception of certain public lands, is optional with the district. Under the old contract the estimated cost involved was \$33,600,000, under the new it is estimated at about \$25,000,000. Pursuant to the provisions of law (Stats. 1917, p. 243) the new contract was examined and reported upon by the State Engineer, under date of December 14, 1932.

DISTRICTS SECURITIES COMMISSION

During December the following matters were acted upon by the California Districts Securities Commission:

Expenditures approved:

Nevada Irrigation District.....	\$44,143
El Nido Irrigation District.....	28,800

Refunding bonds recommended to the State Controller for certification:

Nevada Irrigation District.....	\$8,100,000
Oakdale Irrigation District.....	2,320,000
South San Joaquin Irrigation District.....	4,791,000

A plan for refunding \$14,250,000 in bonds by the Imperial Irrigation District was approved, as was also the new contract of that district with the United States for the construction of the All-American Canal.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

The work of clearing the channels of the Sutter and Tisdale By-passes was continued throughout the past month. The clearing crew averaged about 80 men.

Considerable maintenance work was done on the drainage system. This consisted for the most part of the removal of tules, brush, etc., from the canals. Work was also done on the drainage pumping plants in order to have them in good running condition for the winter pumping season. Another item in this maintenance work was the installation of new trash screens.

Sacramento Flood Control Project—Bank Protection.

On December 20th work was started on the bank protection job on the right bank of the Sacramento River at Tyndall Mound, 12 miles above Knights Landing. A dragline is now at work trimming the bank at this point. Upon completion of this work a rock blanket from one to two feet in thickness will be placed on the slope. Thirty-three hundred tons of rock have been ordered for this purpose. It is estimated the entire job will cost about \$10,000.

Sacramento Flood Control Project—Construction.

Reports have been rendered on several applications before the Reclamation Board and work done under various applications has been inspected.

The clearing of the overflow channel of the Feather River which began November 3d was shut down on December 8th, all available funds having been expended. This work involved the expenditure of \$14,000, representing 3,126 man days and gave employment to 541 different men.

At the regular monthly meeting on December 21st the Reclamation Board allocated \$1,080 for clearing work on the American River flood control project. Work will be carried on by the Division of Water Resources.

More Water Power for Los Angeles

(Continued from page 25)

Russian River Jetty.

Early in December \$5,000 was made available from the emergency fund to carry on the maintenance of the Russian River jetty. It is estimated that this money will be sufficient to keep a crew of from 10 to 12 men engaged in the placing of rock until about February 1st.

Flood Measurements and Gages.

All our gaging stations are now in operation. The work of putting the metering equipment in serviceable condition is in progress. An improved sounding boom to be used for making flood discharge measurements has been developed by this office. Four booms are now being constructed for use during the present flood season.

Emergency Flood Protection and Rectification of Rivers.

A small cooperative bank protection job is being carried on at the mouth of Little River, Humboldt County. This work is being done in cooperation with Hammond and Little River Redwood Co. Ltd. The work consists of reinforcing a pile and timber bulkhead with rock and gravel.

WATER RIGHTS

Applications to Appropriate.

Thirty-three applications to appropriate water were received during the month of November; 20 were denied and 16 were approved. In the same period 9 permits were revoked and 7 were passed to license.

Among the more important applications were two by George W. Spencer of Los Angeles seeking to appropriate from Baldwin Lake and Arrastra Creek for irrigation purposes at an estimated cost of \$135,000.

Among the more important permits issued was one allowing the reappropriation and reuse by the Pacific Gas and Electric Company at its Folsom power plant of the water stored on upper South Fork of American River and used at the Eldorado and American River plants.

Three applications of the City of Los Angeles which were approved during the month involve appropriations for power purposes from Cottonwood Creek and tributaries and Big Pine Creek and tributaries in Inyo County and Rock Creek and tributaries in Mono County at an estimated cost of \$6,800,000. Another application of the City of Los Angeles which was approved involved an appropriation for municipal purposes from Symmes Creek in Inyo County at an estimated cost of \$49,000.

ADJUDICATIONS

Eagle Creek (Modoc County). The report covering the distribution of the water of Eagle Creek in

accordance with the trial schedule of allotments adopted for the 1932 season has been completed.

South Fork Pit River (Modoc County). The report covering the field work on the investigation of the water supply and use of water on the South Fork Pit River is 50 per cent completed.

Hat Creek (Shasta County). The stipulation for judgment prepared by the Division is being circulated by counsel among the interested parties.

Deep Creek, Franklin Creek, Cottonwood Creek and Pine Creek in Surprise Valley (Modoc County). Reports on these court reference cases will be prepared following completion of the South Fork of Pit River reports.

Pit River in Big Valley (Modoc and Lassen Counties). The report covering supervision of diversions from Pit River in Big Valley for the 1932 season is 75 per cent completed.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Work during the past month has been chiefly in the office in computing and compiling all data for the 1932 report of the diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory. Field work has comprised the maintenance of a reduced number of salinity stations and the eight Delta tide gages. Since the recent storm the flow of the Sacramento River at Sacramento has increased to about 6200 second-feet, somewhat accelerating the recession of salinity occurring in the vicinity of Sherman Island at the lower point of the Delta. Salinity of 100 parts of chlorine per 100,000 is now only a short distance above Antioch and Collinsville. In the following tabulation the salinity on December 10, 1932 at some of the Delta stations is compared to the corresponding salinity on December 10, 1931.

Station—	Salinity in parts of chlorine per 100,000 parts of water	
	12/10/32	12/10/31
Point Orient.....	1560	1820
Point Davis.....	1360	1500
Bullshead.....	1060	1235
Bay Point.....	760	960
Collinsville.....	260	370
Emmaton.....	10	164
Rio Vista.....	1	19
Antioch.....	180	390
Jersey.....	52	98
Central Landing.....	4	34
Middle River P. O.....	8	110

CALIFORNIA COOPERATIVE SNOW SURVEYS

Work on this project during the past month has been entirely in the office in computing the 1931-32

Report Issued on Salinity Control

(Continued from preceding page)

natural flow at the various stream gaging stations which reflect snow run-off. These computations have shown that in general the seasonal and April-July run-off corresponded closely with the quantities forecast on April 1st based on snow surveys. Other office work has included routine maintenance to date of precipitation tabulations, etc.

DAMS

Certificates of approval for 546 dams, and 5 certificates of approval of removal have been issued to date.

To date 818 applications for approval of dams built prior to August 14, 1929 have been received of which 710 have been found to be under jurisdiction; 108 for approval of plans for construction or enlargement and 374 applications for approval of plans for repair, alteration or removal.

Fifteen dams are under construction or enlargement and 130 are under repair.

Applications Received for Approval of Plans and Specifications for Construction or Enlargement.

Dam	County
Grant Company Lake *	Frank McArthur; Christensen and Humphrey
Payne *	Paragon Gravel Mine
Bayley *	
Paragon **	
Owner	County
J. D. Grant Company	Santa Clara
Frank McArthur	Modoc
	Modoc
	Placer

Applications Received for Approval of Plans for Repair.

Dam	County
Durant	Alameda
Owner	
Bank of America, N. T. & S. A.	

Plans Approved for Construction or Enlargement.

Dam	County
Williamson *	Frank McArthur; Christensen & Humphrey
Dry Canyon *	Sweetwater Fruit Company
Payne *	
Bayley *	
Keen Valley **	
Owner	County
Hector Williamson	El Dorado
City of Los Angeles	Los Angeles
Frank McArthur	Modoc
	Modoc
	San Diego

Plans Approved for Repair or Alteration.

Dam	County
Sharp Park	Hunewill, Dressler & Simpson
Lower Twin Lakes	Bank of America
Durant	
Owner	County
City and County of San Francisco	San Mateo
	Monterey
	Alameda

The great number of dams undergoing repair is especially noticeable for this time of the year due to requests from the department, instituted prior to August 14th of this year. According to

the Dam Act, which placed August 14 as the limiting date, owners either voluntarily submitted application to place their dams in the condition required by this office, or in a few cases, were ordered to do the work. In all but a few isolated cases, those to whom orders were issued are complying with them to the best of their ability.

COOPERATIVE TOPOGRAPHIC MAPPING

The Division of Water Resources in cooperation with the Topographic Branch of the U. S. Geological Survey has recently completed field work in connection with the Truckee, Bartle and Colfax sheets and an unnamed sheet immediately west of Corcoran, presently designated as No. 41. Topographic mapping of the Treadwell and East half of Whiteriver sheets and two additional unnamed sheets presently designated as Nos. 39 and 40, west of Corcoran is in progress. Horizontal controls have recently been established for the area immediately north of Ukiah and vertical controls are being established in the vicinity of Healdsburg, Sebastapol, Eureka, Willows and Red Bluff and to the west of Williams.

The advance sheet (uncolored) covering the La Panza quadrangle has recently been released.

In addition to the cooperative work, topographic surveys of the Yreka and North half of Dixie sheets have recently been completed by the Geological Survey for the U. S. Forest Service.

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties). Work on the report covering the three years' investigation was continued during the present month.

Salinas Valley, Mojave River, Ventura County and South Coastal Basin Investigations. Progress is being made on these investigations which are proceeding along routine lines.

STATE WATER PLAN

The Director of Public Works announced the release by the State Engineer of a report on the "Variation and Control of Salinity in Sacramento-San Joaquin Delta and Upper San Francisco Bay," during the present month. The report is published as Bulletin No. 27 of the Division of Water Resources of the State Department of Public Works, and is one of the series of reports prepared on the State Water Plan.

This report is the result of intensive investigations and studies by the State of salinity conditions in the Sacramento-San Joaquin Delta and upper bay channels which have been under way for over ten years.

As a result of the analytical studies of this investigation, a method has been found for effective

(Continued on page 36)

* Enlargement.

** New construction.

Water Applications and Permits

APPLICATIONS FILED

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources during the month of December, 1932.

TRINITY COUNTY—Application 7450. Norris R. Ferguson, Junction City, Cal., for 0.1 c.f.s. from unnamed stream tributary to Canyon Creek, thence Trinity River to be diverted in Sec. 36, T. 34 N., R. 11 W., M. D. B. and M. For mining and domestic purposes. Estimated cost \$75.

SISKIYOU COUNTY—Application 7451. H. W. A. Docker, Forks of Salmon, Cal., for 6 c.f.s. from Granite Creek, tributary to Knownothing Creek, thence South Fork Salmon River, to be diverted in Sec. 7, T. 9 N., R. 8 E., H. B. and M. For power purposes. Estimated cost \$800.

STANISLAUS COUNTY—Application 7452. J. M. de Souza, Route 3, Box 944, Modesto, Cal., for 0.5 c.f.s. from Tuolumne River, tributary to San Joaquin River, to be diverted in Sec. 12, T. 4 S., R. 7 E., M. D. B. and M. For irrigation purposes (40 acres). Estimated cost \$100.

VENTURA COUNTY—Application 7453. W. A. Matthews, Box 323, Maricopa, Cal., for 2 miners' inches from Blue Rock Springs, tributary to Quatal Canyon, thence Cuyama River to be diverted in Sec. 20, T. 9 N., R. 23 W., S. B. B. and M. For irrigation and domestic purposes (3 acres). Estimated cost \$600.

ELDORADO COUNTY—Application 7454. C. M. Carter, R. D. Nicol and W. P. Austin, 1733 Jefferson Street, Oakland, Cal., for 100,000 acre-feet per annum from South Fork American River tributary to American River, thence Sacramento River to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. (For municipal purposes. Estimated cost \$9,000,000.

ELDORADO COUNTY—Application 7455. C. M. Carter, R. D. Nicol and W. P. Austin, 1733 Jefferson Street, Oakland, Cal., for 614,000 acre-feet per annum from South Fork American River tributary to American River, thence Sacramento River, to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For irrigation purposes (450,000 acres). Estimated cost \$9,000,000.

PLACER AND SUTTER COUNTIES—Application 7456. William A. Glenn, 2300 Portola Way, Sacramento, Cal., for 3 c.f.s. and 8 acre-feet per annum from Auburn Ravine tributary to Sacramento River, to be diverted in Sec. 30, T. 12 N., R. 5 E., and Sec. 26, T. 12 N., R. 4 E., M. D. B. and M. For irrigation and domestic purposes (760 acres). Estimated cost \$500.

PLACER COUNTY—Application 7457. Dr. J. L. Hardin, 2300 Portola Way, Sacramento, Cal., for 3 c.f.s. and 9 acre-feet per annum from Auburn Ravine, tributary to Sacramento River, to be diverted in Secs. 28 and 30, T. 12 N., R. 5 E., M. D. B. and M. For irrigation and domestic purposes (700 acres). Estimated cost \$500.

MODOC COUNTY—Application 7458. Frank McArthur, Alturas, Cal., for 1155 acre-feet per annum from Fitzhugh Creek, tributary to South Fork Pit River, to be diverted in Sec. 23, T. 41 N., R. 13 E., M. D. B. & M. For irrigation, domestic and stock-watering purposes (1240 acres).

HUMBOLDT COUNTY—Application 7459. Ralph Coleman, Salyer Creek, for 0.01 c.f.s. from Unnamed Spring, tributary to Trinity River, to be diverted in Sec. 16, T. 6 N., R. 5 E., H. B. and M. For domestic purposes. Estimated cost \$225.

ELDORADO COUNTY—Application 7460. B. W. Stone, 161 Ellis Street, San Francisco, Cal., for 500 c.f.s. and 125,000 acre feet per annum from Rubicon River, Pilot Creek, Gerle Creek, Loon Lake, Buck Island Lake, Rockbound Lake and Little South Fork of Rubicon River, tributary to American River Drainage Area, to be diverted in Sec. 9, T. 13 N., R. 16 E.; Sec. 11, T. 12 N., R. 12 E.; Sec. 24, T. 13 N., R. 13 E.; Secs. 11, 31, 34, T. 14 N., R. 14 E.; Sec. 4, T. 13 N., R. 15 E., and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

LASSEN COUNTY—Application 7461. R. R. Richmond, 1515 Market Street, Oakland, Cal., for 0.07 c.f.s. from 6 unnamed hot springs tributary to Pit River Drainage Area, to be diverted in Sec. 14, T. 38 N., R. 8 E., M. D. B. and M. For recreational and domestic purposes. Estimated cost \$500.

ORANGE COUNTY—Application 7462. George H. Veeh, c/o Geo. L. Bates, Engineer, Abstract & Title Insurance Bldg., Santa Ana, Calif., for 46 acre-feet per annum from unnamed gulch, tributary to Newport Bay, to be diverted in Sec. 29, T. 6 S., R. 8 W., S. B. B. and M. For irrigation and domestic purposes (43 acres).

LOS ANGELES COUNTY—Application 7463. G. H. Burkhardt, 2681 Longwood Ave., Los Angeles, Cal., for 200 acre-feet per annum, from Middle Fork of Palmett Creek, tributary to Big Rock Creek, to be diverted in Sec. 23, T. 4 N., R. 10 W., S. B. B. and M. For irrigation and domestic purposes (150.25 acres).

LOS ANGELES COUNTY—Application 7464. G. L. Poser and Hyman Levin, c/o Hyman Levin, 525 North Mission Road, Los Angeles, Cal., for 0.025 c.f.s. from unnamed spring, tributary to Middle Fork Palmett Creek, to be diverted in Sec. 23, T. 4 N., R. 10 W., S. B. B. and M. For irrigation and domestic purposes (48½ acres). Estimated cost \$1000.

LOS ANGELES COUNTY—Application 7465. G. L. Poser and Hyman Levin, c/o Hyman Levin, 525 North Mission Road, Los Angeles, Cal., for 200 acre-feet per annum from Middle Fork Palmett Creek, tributary to Big Rock Creek, to be diverted in Sec. 23, T. 4 N., R. 10 W., S. B. B. and M. For irrigation and domestic purposes (60 acres).

LOS ANGELES COUNTY—Application 7466—Department of Public Works, Division of Highways, Public Works Bldg., Sacramento, Cal., for 0.003 c.f.s. from unnamed spring, tributary to Piru Creek, to be diverted in Sec. 2, T. 6 N., R. 18 W., S. B. B. and M. For industrial and domestic purposes.

NEVADA COUNTY—Application 7467. Walter N. Sim, Nevada City, Cal., for a total of 1000 miners' inches from (1) South Fork Yuba River, tributary to Yuba River, and (2) Diamond Creek, tributary to South Fork Yuba River, to be diverted in (1) Sec. 18, T. 17 N., R. 12 E., and (2) Sec. 10, T. 17 N., R. 11 E., M. D. B. and M. For power and domestic purposes (1140 h.p.). Estimated cost \$15,000.

NEVADA COUNTY—Application 7468. Walter N. Sim, Nevada City, Cal., for 1000 miners' inches from South Fork Yuba River, tributary to Yuba River, to be diverted in Sec. 18, T. 17 N., R. 12 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$8,000.

LOS ANGELES COUNTY—Application 7469. Properties, Inc., c/o Seaboard Engineering and Contracting Co., 404 Douglas Bldg., 257 South Spring Street, Los Angeles, Cal., for 0.001 c.f.s. and 100,000 gallons per annum from unnamed spring, tributary to Piru Creek, to be diverted in Sec. 30, T. 6 N., R. 17 W., S. B. B. and M. For irrigation and stock-watering purposes (60 acres).

DEL NORTE COUNTY—Application 7470. G. M. Willoughby and Daisy V. and Clark Terwilliger, c/o Clark Terwilliger, Crescent City, Cal., for 3 c.f.s. from Cedar Springs, tributary to Smith River, to be diverted in Sec. 36, T. 17 N., R. 2 E., H. B. and M. For mining purposes. Estimated cost \$25.

DEL NORTE COUNTY—Application 7471. G. M. Willoughby and Daisy V. and Clark Terwilliger, c/o Clark Terwilliger, Crescent City, Cal., for 3 c.f.s. from Fork of Coon Creek, tributary to Smith River, to be diverted in Sec. 36, T. 17 N., R. 2 E., H. B. and M. For mining purposes. Estimated cost \$50.

PLUMAS COUNTY—Application 7472. J. La Rue Robinson and Elizabeth Evans Robinson, 539 Riverside Drive, Reno, Nev., for 500 acre-feet per annum from Taylor Lake, tributary to Hungry Creek, thence Indian Creek, to be diverted in Sec. 35, T. 27 N., R. 11 E., M. D. B. and M. For irrigation and stock-watering purposes (510 acres).

MENDOCINO COUNTY—Application 7473. Heath Angello, Branscomb, Cal., for 2.5 c.f.s. from Elder

Water Permits Issued in December

(Continued from preceding page)

Creek, tributary to South Fork Eel River, to be diverted in Sec. 29, T. 22 N., R. 16 W., M. D. B. and M. For power purposes (ram). Estimated cost \$500.

SAN JOAQUIN COUNTY—Application 7474. C. B. Orvis and Wm. S. Orvis, 927 North Harrison Street, Stockton, Cal., for 6.0 c.f.s. from Upland Canal, tributary to Sycamore Slough, thence South Fork Mokelumne River, to be diverted in Sec. 33, T. 4 N., R. 5 E., M. D. B. and M. For irrigation purposes (303.89 acres). Estimated cost \$5,500.

LOS ANGELES COUNTY—Application 7475. J. F. Hutak, Littlerock, Cal., for 0.025 c.f.s. from Spring, tributary to Mojave Desert, to be diverted in Sec. 18, T. 4 N., R. 10 W., S. B. B. and M. For irrigation and domestic purposes (10 acres). Estimated cost \$250.

HUMBOLDT COUNTY—Application 7476. Domingo Silva, Jr., and William Silva, c/o W. A. Beer, Arcata, Cal., for 3.00 c.f.s. from Mad River, tributary to Pacific Ocean, to be diverted in Sec. 7, T. 6 N., R. 1 E., H. B. and M. For irrigation purposes (100 acres). Estimated cost \$3,000.

SAN DIEGO COUNTY—Application 7477. James K. Baner, Route No. 1, Box 309E, Escondido, Cal., for 5 acre-feet per annum from unnamed stream, tributary to San Dieguito River, to be diverted in Sec. 18, T. 13 S., R. 1 W., S. B. B. and M. For irrigation and domestic purposes (6 acres). Estimated cost \$300.

PERMITS ISSUED

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources during the month of December, 1932.

MONO COUNTY—Permit 4032, Application 7286. George J. Davlin, 5157 8th Avenue, Los Angeles, Cal., December 3, 1932, for 100 gallons per day from unnamed stream, tributary to Twin Lakes and Owens River, in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes. Estimated cost \$60.

RIVERSIDE COUNTY—Permit 4033, Application 7296. Chapman Blackburn, Hemet, Cal., December 3, 1932, for 8,000 gallons per day from unnamed stream, tributary to San Jacinto River watershed in Sec. 30, T. 5 S., R. 1 E., S. B. B. and M. For domestic and stock-watering purposes. Estimated cost \$200.

MARIPOSA COUNTY—Permit 4034, Application 7338. John C. McGarry, Incline, Cal., December 3, 1932, for 0.22 c.f.s. from Cranberry Gulch, tributary to Merced River, in Sec. 22, T. 3 S., R. 19 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$400.

INYO COUNTY—Permit 4035, Application 7292. Joseph W. Rossi, Bishop, Cal., December 6, 1932, for 0.50 c.f.s. from Crystal Spring, tributary to Owens River watershed, in Sec. 26, T. 7 S., R. 32 E., M. D. B. and M. For irrigation and domestic purposes on 22½ acres. Estimated cost \$1,500.

HUMBOLDT COUNTY—Permit 4036, Application 7361. Charles Doss, Orleans, Cal., December 6, 1932, for 3.00 c.f.s. from Red Cap Gulch, tributary to Klamath River in Sec. 9, T. 10 N., R. 5 E., H. B. and M. For hydraulic mining. Estimated cost \$1,000.

SIERRA COUNTY—Permit 4037, Application 7383. Clifford A. Thompson, Sierra City, Cal., December 7, 1932, for 3.00 c.f.s. from Howard Creek, tributary to North Fork North Fork Yuba River, in Sec. 26, T. 21 N., R. 12 E., M. D. B. and M. For mining purposes. Estimated cost \$500.

SISKIYOU COUNTY—Permit 4038, Application 7396. Helen Russell Prince, 726 Sutter Street, San Francisco, Cal., December 7, 1932, for 0.50 c.f.s. from North Fork Russian Creek, tributary to North Fork Salmon River, in Sec. 19, T. 40 N., R. 10 W., M. D. B. and M. For irrigation and domestic use on 11½ acres. Estimated cost \$200.

TEHAMA COUNTY—Permit 4039, Application 7371. State of California, Department of Public Works, Division of Highways, of Sacramento, Cal., December 10, 1932, for 0.006 c.f.s. from unnamed

spring, tributary to South Fork Battle Creek, thence Sacramento River, in Sec. 24, T. 29 N., R. 3 E., M. D. B. and M. For domestic and fire protection uses. Estimated cost \$1,100.

MONO COUNTY—Permit 4040, Application 7355. Charles E. Day, Bridgeport, Cal., December 10, 1932, for 0.02 c.f.s. from Mono Lake Jim Spring, tributary to Upper Twin Lake, thence Robinson Creek and East Walker River, in Sec. 6, T. 3 N., R. 24 E., M. D. B. and M. For domestic and lawn purposes. Estimated cost \$300.

DEL NORTE COUNTY—Permit 4041, Application 7221. Carl Bruno, Klamath, Cal., December 12, 1932, for 0.075 c.f.s. from 2 unnamed streams, tributary to small stream that flows into Pacific Ocean about 1 mile below, in Sec. 20, T. 14 N., R. 1 E., H. B. and M. For power purposes. Estimated cost \$2,500.

DEL NORTE COUNTY—Permit 4042, Application 7222. Carl Bruno, Klamath, Cal., December 12, 1932, for 0.037 c.f.s. from 3 unnamed streams tributary to small stream that flows into Pacific Ocean 1 mile below, in Sec. 20, T. 14 N., R. 1 E., H. B. and M. For domestic and recreational purposes. Estimated cost \$2,000.

MONO COUNTY—Permit 4043, Application 7359. Gilbert C. Wedertz, Bridgeport, Calif., December 14, 1932, for 200 gallons per day from unnamed spring, tributary to Upper Twin Lake, thence Robinson Creek and East Walker River, in Sec. 6, T. 3 N., R. 24 E., M. D. B. and M. For domestic purposes and garden irrigation. Estimated cost \$76.

INYO COUNTY—Permit 4044, Application 7359. City of Los Angeles, Los Angeles, Cal., December 17, 1932, for 20 c.f.s. and 18,966 acre-feet per annum from Baker Creek and Sanger Meadow Fork of Baker Creek, in Secs. 15, 11 and 13, T. 9 S., R. 32 E., M. D. B. and M. For power purposes in Los Angeles. 9,646 t.h.p. to be developed. Estimated cost \$750,000.

SISKIYOU COUNTY—Permit 4045, Application 7333. Wm. A. Paxton, Los Angeles, Cal., December 19, 1932, for 2 c.f.s. from Deadwood Creek, in Sec. 20, T. 45 N., R. 8 W., M. D. B. and M. For power and domestic use. 4½ t.h.p. to be developed. Estimated cost \$100.

SISKIYOU COUNTY—Permit 4046, Application 7342. George Steiner and Jack R. O'Donovan, Happy Camp, Cal., Dec. 22, 1932, for 1 c.f.s. from Cole Creek, in Sec. 10, T. 17 N., R. 6 E., H. B. and M. For mining purposes. Estimated cost \$50.

MONO COUNTY—Permit 4047, Application 7354. Mrs. Louise M. Green, Arcadia, Cal., December 27, 1932, for 200 gallons per day from unnamed stream in Sec. 9, T. 4 S., R. 27 E., M. D. B. and M. For domestic use. Estimated cost, \$50.

PLACER COUNTY—Permit 4048, Application 7334. U. S. Tahoe National Forest, Nevada City, Cal., December 27, 1932, for 32,500 gallons per day from Brockway Tract Springs, in Sec. 12, T. 16 N., R. 17 E., M. D. B. and M. For domestic and fire protection. Estimated cost \$750.

GOT THE WORKS

"Before Amos was married he said he would be the boss or know the reason why."

Chester: "And now?"

Ralph: "He knows the reason why."—*Lindsay Post.*

Driver of Lorry—Sound your 'orn, missus.

Lady Driver—Sound your 'atches.

She—We really should get a new car this year.

He—What! When I'm still paying installments on the car I sold in part payment for the car I traded for the car I've got now?

Vital Statistics on Dam Applications and Improvements

APPLICATIONS FILED

Applications for approval of dams built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources during the month of December, 1932.

LASSEN COUNTY—Bailey Creek Dam, No. 1227. J. B. Leavitt, Susanville, owner; earth, 12 feet above streambed, situated on Bailey Creek in Sec. 15, T. 34 N., R. 12 E., M. D. B. and M. For storage purposes for fish pond use.

MADERA COUNTY—Sierra Vista Dam No. 681. Sierra Vista Vineyard Company, Chowchilla, owner; earth, 5 feet above streambed with a storage capacity of 90 acre-feet, situated on Chowchilla River, tributary to San Joaquin River in Sec. 13, T. 9 S., R. 15 E., M. D. B. and M. For diversion purposes for irrigation use.

Applications for approval of plans and specifications for construction or enlargement of dams filed with the State Department of Public Works, Division of Water Resources during the month of December, 1932.

MODOC COUNTY—Bayley Dam No. 128-3. Frank McArthur; Christensen and Humphrey, Likely, owners; earth, 11½ feet above streambed situated on Crook Canyon, tributary to Pit River in Sec. 32, T. 40 N., R. 12 E., M. D. B. and M. For storage purposes for irrigation use. Estimated cost \$2,000, fees paid \$20.

PLACER COUNTY—Paragon Dam No. 328. Paragon Gravel Mine, Forest Hill, owner; boulders and cobbles, 25 feet above streambed situated on Volcano Canyon, tributary to North Fork Middle Fork American River in Sec. 31, T. 14 N., R. 11 W., M. D. B. and M. For storage of debris. Estimated cost less than \$2,000, fee paid \$20.

Applications for approval of plans and specifications for repair or alteration of dams filed with the State Department of Public Works, Division of Water Resources during the month of December, 1932.

ALAMEDA COUNTY—Durant Dam No. 593. Bank of America N. T. & S. A., Oakland, owner; earth, situated on Durant Estate, East Oakland.

VENTURA COUNTY—Lake Sherwood Dam No. 765. Lake Sherwood Country Club, Hollywood, owner; slab and buttress, situated on Triunfo Creek, tributary to Malibu Creek in Sec. 27, T. 1 N., R. 19 W., S. B. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources during the month of December, 1932.

SAN DIEGO COUNTY—Keen Valley Dam No. 846. Sweetwater Fruit Company of California, Bonita, owner; earth, 22 feet above streambed with a storage capacity of 50 acre-feet, situated on Keen Valley Wash, tributary to Sweetwater River, located in quarter-section 75, Rancho del a Nation. For storage purposes for flood control and irrigation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources during the month of December, 1932.

ALAMEDA COUNTY—Durant Dam No. 593. Bank of America, N. T. & S. A., Oakland, owner; earth, located in East Oakland.

"Do you think," said the intellectual young woman, "that there is any truth in the theory that big creatures are better-nurtured than small ones?"

"Yes," answered the young man, "I do. Look at the difference between the Jersey mosquito and the Jersey cow."—*Georgia Highways*.

Cut in Federal Aid Threatens Boost in Taxes on Property

"**A** MERICAN land owners face a serious hazard in the stampede of Congress to 'economy at any price'" declared C. H. Moorefield, president of the American Association of State Highway Officials, in a statement issued today. The proposal to make drastic cuts in Federal Aid to State highways was specified by Mr. Moorefield as a potential danger to the owners of property.

"Decreases in Federal aid, coupled with the practice of gas tax diversion within individual states, will inevitably throw an increased burden on the already overburdened property owners," Mr. Moorefield stated. "As Secretary of Agriculture Arthur M. Hyde recently pointed out, decreased road income means defaulted bonds which, in turn, will force the states to increase property taxes in order to preserve their credit.

"To safeguard present highway investments and to continue the much needed extension of State highways, the Congress must continue the appropriation for each of the fiscal years of 1934 and 1935."

"Heedless reduction of Federal aid for highways," Mr. Moorefield added, "will serve to throw out of employment many of the more than 330,000 men regularly employed in road work. Those men and their families will tend to become dependent on public relief funds; larger diversions may then be made from gas tax income, highways will become static and the ultimate burden will fall back on the already harassed property owner."

THROUGH TRAFFIC PROBLEM

The danger of picking out the main street of a town and arbitrarily making it a through street, as pointed out in recent studies by the National Safety Council, has recently been emphasized in several Illinois towns.

Petitions have been received by the State Highway Commission, from representatives of small towns and villages asking that State roads be rerouted so that the constant stream of traffic may be diverted from their centers.

According to the representatives, it was once thought advantageous to bring as much traffic into the main street as possible, for transient trade meant increased business. The flow of cars, however, has become so great and the rate at which they travel so rapid that it actually hampers the transaction of local business.

Even large cities are now finding that the most successful system shunts non-stop traffic around the business district to avoid congestion in the down-town centers.—*New Mexico Magazine*.

Highway Projects in 1933-35 Budget

(Continued from page 1)

In making recommendations for the proposed budget, a determined effort has been made to use the utmost economy in providing for and maintaining adequate traffic service over the entire system of highways and to apply funds where most urgently needed.

At the end of the present biennium, all the funds available during the 1931-33 period will have been expended, such revenue having been put to immediate use as soon as received for maximum employment needed under present conditions.

BAY BRIDGE FUNDS

For building the approaches to the San Francisco-Oakland Bay Bridge, \$1,500,000 for grading and paving is set up as an allotment to cover that project.

A total allotment of \$2,950,000 for convict labor camps is to be used for the maintenance of these camps and carrying on of construction in various of the northern 45 counties, such as the Feather River Highway, the Carmel-San Simeon Highway in Monterey County, the Alturas Lateral, the Trinity Lateral, and the Kings River Highway in Fresno County.

There is set up for cooperative city projects, in the northern 45 counties, \$1,442,280; and in the southern 13 counties, \$2,440,532. These appropriations are to cover the State's share of work on State highway routings through incorporated cities.

Construction and reconstruction projects included in the budget, as submitted, are as follows:

ROUTE 1, REDWOOD HIGHWAY

(San Francisco to the Oregon State Line)

SONOMA AND MENDOCINO COUNTIES—From Cloverdale to Hopland, 13.8 miles, \$652,500, for grading, paving, bridges and grade separations. This allotment will provide additional improvement necessary to open the road to traffic. Grading of the road was undertaken in the current biennium on this new routing, which saves $1\frac{1}{2}$ miles in distance and substitutes light, wider grade and excellent alignment for long stretches of maximum grade and low standard alignment.

MENDOCINO COUNTY—Rattlesnake Bridge and approaches, 0.6 miles, \$66,800, for the construction of a bridge and the grading and surfacing of the approaches. The old timber structure is becoming dangerous and has outlived its usefulness. It must be replaced.

MENDOCINO AND HUMBOLDT COUNTIES—County line bridge and approaches, 1.2 miles, \$211,900, for the

construction of a bridge and the grading and surfacing of the approaches. This bridge is dangerous because of the failures of various members in the bridge which have been temporarily repaired. It must be replaced; and in replacing it, more adequate approaches on better standard of alignment and grade will be constructed.

Humboldt County

Smith Ranch to Twin Trees, 0.7 mile, \$116,300, for the construction of a bridge and the grading and surfacing of the approaches. The Twin Trees Bridge is in dangerous condition, and the approaches to the present bridge are dangerous and crooked with sharp curvature. The construction of a new bridge with improved alignment for the approaches is planned.

Benbow to 7 miles north of Garberville, 7.5 miles, \$575,800, for grading, surfacing and construction of bridges. This project consists of two sections; one from Benbow to Garberville and the other from Bluff Creek to 2 miles north of Dean Creek. This section of the Redwood Highway is one of the most dangerous, being narrow and crooked and on steep grades. Some of the heaviest traffic on the Redwood Highway is encountered on this section, and it must be reconstructed to better standards to eliminate the hazards.

Jordan Creek to South Scotia Bridge, 2 miles, \$102,100, for grading and surfacing, Relocation and improvement of this section at Brown's Mill will make a decided improvement in the alignment and distance.

Trinidad to Big Lagoon, 9 miles, \$80,000, for additional and improved surface. Present surface is failing because it is inadequate and, consequently, requires a high maintenance expenditure.

Feather River Bridge and approaches, 0.5 mile, \$73,300, for the construction of a bridge and the grading and surfacing of the approaches. The present old concrete structure is failing and is in dangerous condition. It is narrow and should be rebuilt to properly carry traffic and to provide safety.

Redwood Creek Bridge, \$9,000, for the construction of a sidewalk. Pedestrians and school children who daily cross this bridge are endangered by having to use the roadway portion of the bridge at the present time. A sidewalk must be constructed.

Del Norte County

Last Chance Slide to Flannigan's, 9.2 miles, \$565,700, for grading. This section of highway includes the road through the State park, known as Graves Grove, and over the Del Norte Bluffs. It is narrow and dangerous, with poor alignment and heavy grade. It is the only remaining section in Del Norte County presenting the most hazardous condition on the Redwood Highway north of the Klamath River.

Oregon Mountain Summit to the State line, 4.2 miles, \$37,500, for surfacing. This section lies in snow country, and the present surface is inadequate to support traffic.

ROUTE 2, COAST HIGHWAY

(San Francisco to Mexican Line)

SAN MATEO COUNTY—San Mateo to Redwood City, 4.9 miles, \$435,000, for grading and paving. Large traffic volume on this highway requires the widening of the pavement and resurfacing of the existing pavement to strengthen it.

Monterey County

Chualar to 6 miles south of Gonzales, 11 miles, \$361,000, for grading and paving. This allotment provides for the reconstruction and resurfacing of a portion of the original 15-foot light type pavement built many years ago.

From a point 6 miles south of San Ardo to Bradley, 5.6 miles, \$339,500, for grading, paving and construction of bridges. The present 15-foot thin type pavement built years ago is rapidly failing and is inadequate to properly serve traffic.

King City to Greenfield, 11.1 miles, \$369,000, for grading and paving. This is another section of 15-foot light type pavement no longer adequate to serve traffic and rapidly failing.

SAN LUIS OBISPO COUNTY—Pismo to San Luis Obispo, portions, 2.1 miles, \$77,500, for paving. This allotment is to cover the cost of paving gaps which were originally left where high fills have been constructed, allowing for their settlement.

Santa Barbara County

Santa Maria to Santa Maria River, 0.7 miles, \$27,000, for grading and paving. This is a short section of old 15-foot pavement which should be resurfaced and widened.

Richfield Tower to Santa Maria, 1.5 miles, \$62,000, for grading and paving. This is the remaining narrow section of 15-foot pavement connecting with the reconstructed State highway through Solomon Canyon.

Nojoqui Grade, 3.7 miles, \$479,000, for the grading, paving and construction of bridges. This section of State highway carrying heavy traffic is narrow, has poor alignment with many sharp curves and steep grades.

Tajiguas to Arroyo Quemado, 1.4 miles, \$60,000, for grading and paving. On this section, the State Highway and the following one, the present road makes sharp and abrupt dips on steep grades and poor alignment into the many canyons along this section of the coast. This hazardous condition is to be remedied.

Arroyo Hondo to Gaviota, 5.3 miles, \$315,000, for grading and paving.

Hollister Avenue Subway to Santa Barbara, 1.6 miles, \$113,800, for grading and paving. This is a connection outside of the city of Santa Barbara to the proposed new through route through that city.

Ortega Hill and San Ysidro Road to Santa Barbara, 1.9 miles, \$147,000, for grading and paving. Widening of the pavement over Ortega Hill to eliminate hazards and through Montecito approaching Santa Barbara to adequately serve heavy traffic, is necessary.

Ventura County

Ventura to Westerly Boundary, 12 miles, \$672,000, for grading and paving. The present 20-foot road has reached its capacity and must be widened to properly serve traffic.

Stallo to Santa Clara River, 3.4 miles, \$72,000, for grading and paving. This is a short section of old 15-foot pavement which requires resurfacing and widening.

Southerly Boundary to Newbury Park, portions, 1.2 miles, \$40,000, for grading and paving. Sharp curvature offering hazardous conditions to large volume of traffic should be corrected.

LOS ANGELES COUNTY—Calabasas to West Boundary, portions, 3.3 miles, \$132,000, for grading and paving. Much needed correction on poor alignment offering hazards to traffic is provided by this allotment.

ORANGE COUNTY—Trabuco Creek, \$26,000, for the construction of a bridge. This bridge is structurally dangerous and requires replacement.

San Diego County

Santa Margarita River Bridge, \$200,000, for the construction of a new bridge. This bridge is failing and requires replacement.

Oceanside to San Mateo Creek, 18 miles, \$479,000, for grading, paving and bridge construction. Large increase in traffic requires widening of the pavement.

Del Mar to Oceanside, 16.4 miles, \$535,000, for grading, paving and bridge construction. This section of State highway also requires widening, due to the large increase in traffic.

National City to San Ysidro, 10 miles, \$285,000, for grading and paving. This is part of the heavily traveled road from San Diego to the Mexican Boundary and requires improvement to adequately serve traffic.

ROUTE 3, PACIFIC HIGHWAY

(Sacramento to Oregon State Line—East Side)

YUBA COUNTY—Wheatland to Morrison's Crossing, 2.5 miles, \$117,000, for grading, paving and construction of bridges. This is a section of narrow 15-foot thin type pavement subject to overflow, which is to be reconstructed and widened.

TEHAMA COUNTY—South Boundary to Red Bluff, 26.5 miles, \$250,000, for grading and surfaced shoulders. The existing 15-foot pavement is to be widened by the construction of adequate surfaced shoulders and by widening the grade.

SHASTA COUNTY—Redding to Sulphur Creek, 1.0 miles, \$253,000, for the construction of a bridge and grading and surfacing of the approach road. This project, in connection with the improvement through the town of Redding, will provide a new crossing of the Sacramento River and a shortening of the distance by about 1 mile.

SISKIYOU COUNTY—At Big Canyon, 0.8 mile, \$86,500, for grading and surfacing. A very hazardous short section, involving sharp curvature, is to be corrected.

BUTTE COUNTY—Pine Creek Bridge and approaches, \$25,300, for construction of a bridge and grading and paving of the approaches. This bridge is inadequate and dangerous for present traffic and must be replaced.

ROUTE 4, GOLDEN STATE HIGHWAY

(Valley Road—Sacramento to Los Angeles)

SACRAMENTO COUNTY—Sacramento to McConnell, \$27,000, for the construction of bridges. Recent reconstruction and widening of the road requires widening of the existing bridges, which is contemplated by this allotment.

STANISLAUS COUNTY—One-half mile south to three-fourths mile north of Turlock, 1.3 miles, \$65,000, for grading and paving. This project, in connection with a proposed improvement for a new through routing through the city of Turlock, will materially benefit a large volume of through traffic.

MADERA COUNTY—Ash Slough, \$40,000, for the construction of a bridge. Present structure is weak and dangerous and requires replacement.

FRESNO COUNTY—Selma to Fowler Switch Canal, 1.8 miles, \$85,300, for grading and paving. This section of narrow, old pavement should be widened and resurfaced to properly serve traffic.

KERN COUNTY—One to two miles south of Delano, 1 mile, \$37,000, for grading and paving. This short section of highway requires resurfacing where the old pavement is failing.

KERN COUNTY—South Boundary to Oak Glen, 6.8 miles, \$752,000, for grading, paving and bridge con-

struction. This section will complete the remaining gap in the reconstructed State highway from Los Angeles to Bakersfield.

LOS ANGELES COUNTY—Santa Clara River to Castaic School, 5.4 miles, \$150,000, for grading and paving. The present road requires widening to properly accommodate large volume of traffic. It connects with the new relocated Ridge Route.

LOS ANGELES COUNTY—Near Newhall to Saugus, 3.2 miles, \$75,000, for grading, paving and construction of bridges. This allotment contemplates the reconstruction of the remaining section of the road between Newhall and Saugus.

ROUTE 5, VIA OAKLAND

(Stockton to Santa Cruz)

SAN JOAQUIN COUNTY—French Camp to McKinley Avenue, 3.5 miles, \$122,000, for paving. Grading and temporary surfacing have been completed, and pavements should now be placed.

ALAMEDA COUNTY—Oakland to 1.3 miles south, 1.3 miles, \$104,300, for grading, paving and bridge construction. This short section of highway immediately south of the city limits of Oakland is necessary to complete the proposed improvement of a cooperative routing within the city.

SANTA CRUZ COUNTY—Inspiration Point to Scott Valley, 6.7 miles, \$277,000, for grading and surfacing. This allotment will complete the relocation of this heavily traveled road between Inspiration Point and Scott Valley and open the road to traffic.

SANTA CRUZ COUNTY—Scott Valley to 1 mile north of Santa Cruz, 3.9 miles, \$300,000, for grading and surfacing. This project, together with the previous one, opens up the entire routing and provides for the reconstructed highway between Inspiration Point and Santa Cruz.

ROUTES 6 AND 7

(Sacramento to Oakland)

YOLO AND SACRAMENTO COUNTIES—At Sacramento, \$433,000, for the construction of a bridge. This allotment contemplates the construction of a new bridge across the Sacramento River, at the entrance of the city of Sacramento, under a cooperative agreement between the State, Sacramento County and the city of Sacramento.

YOLO COUNTY—Causeway to M Street Subway, 3.5 miles, \$122,000, for grading and paving. This improvement is necessary to accommodate the increased traffic on this road and to connect the widened causeway, now under construction, with the city.

YOLO COUNTY—West approach to the causeway, 0.1 miles, \$6,000, for grading and paving. The widened causeway now under construction requires the widening of the west approach.

SOLANO COUNTY—Five and five-tenths miles north of Fairfield to 1 mile south of Vacaville, 3.3 miles, \$172,000, for grading, paving and construction of bridges. This allotment contemplates reconstruction of a section of highway with very inferior alignment and on which a considerable saving in distance can be accomplished.

SOLANO COUNTY—Benicia-Vallejo Road to Cordelia, 11 miles, \$400,000, for grading. This is the so-called American Canyon Routing, which will save $4\frac{1}{2}$ miles in distance between Sacramento and Oakland and provide an adequate through routing for a large volume of traffic.

SOLANO COUNTY—One mile north of Carquinez Bridge to Vallejo-Benicia Road, 1.5 miles, \$59,000,

for grading. This is a section of the American Canyon Routing.

ROUTE 7, PACIFIC HIGHWAY

(West Side, Davis Wye to Red Bluff)

COLUSA COUNTY—Maxwell to Notherly Boundary, 8 miles, \$381,000, for grading, paving and construction of bridges. The present narrow 15-foot thin type pavement requires resurfacing and widening.

ROUTE 8, IGNACIO TO NAPA

(Black Point Cutoff)

SONOMA COUNTY—Foster line change, 0.9 mile, \$60,000, for grading and surfacing. This short section of the Black Point Cutoff presents considerable hazards due to poor and inadequate alignment and should be corrected.

ROUTE 9, FOOTHILL BOULEVARD

(San Fernando to San Bernardino)

LOS ANGELES COUNTY—Big Tujunga Wash to Tujunga, 3.3 miles, \$114,000, for grading, paving and bridge construction. This highway must be widened to adequately serve large traffic volume.

ROUTE 10, SIERRA-TO-THE-SEA HIGHWAY

(San Lucas to Sequoia National Park)

MONTEREY COUNTY—San Lorenzo Creek to Priest Valley School, portions, 9.1 miles, \$150,000, for grading. Construction and realignment of a portion of the Mustang Grade is contemplated.

TULARE COUNTY—Visalia to Merryman, 9.9 miles, \$340,000, for grading, paving and bridge construction. The present narrow 15-foot pavement must be widened and resurfaced to adequately serve traffic.

ROUTE 11, PLACERVILLE-TAHOE HIGHWAY

EL DORADO COUNTY—Kyburz to Strawberry, 9 miles, \$115,000, for surfacing. Grading of this section is being undertaken by the Bureau of Public Roads with Forest Highway funds and, together with the grading contemplated in the next item, requires surfacing when completed.

EL DORADO COUNTY—Fred's Place to 2.2 miles easterly, 2.2 miles, \$100,000, for grading. The construction of this remaining section will eliminate some of the worst alignment and grade on this important highway.

ROUTE 12, SAN DIEGO-EL CENTRO HIGHWAY

SAN DIEGO COUNTY—El Cajon easterly, 1.2 miles, \$28,000, for grading and paving. This short section of 15-foot thin type pavement east of El Cajon should be widened and resurfaced to properly care for traffic.

ROUTE 15, TAHOE-UKIAH HIGHWAY

PLACER AND NEVADA COUNTIES—Spaulding Canal to Route 37, 4.1 miles, \$190,000, for grading and surfacing. The construction of this section will complete a connection from the Tahoe-Ukiah Road to the Auburn-Truckee Road leading to the State line and make it possible for traffic to use this important State artery.

NEVADA COUNTY—1 mile west of Washington Road to $\frac{1}{2}$ -mile east of summit, 7.4 miles, \$110,000, for surfacing. Grading has been completed and an adequate surface is necessary.

ROUTE 18, YOSEMITE HIGHWAY

MARIPOSA COUNTY—Orange Hill School to Mariposa, 15 miles, \$275,000, for surfacing. Grading has

been completed, and surfacing must be placed to make the road available for traffic.

ROUTE 19, BEAUMONT TO RIVERSIDE

(Jack Rabbit Trail)

RIVERSIDE COUNTY—Beaumont to Riverside, portions, 19 miles, \$601,800, for grading, surfacing and structures. This allotment will provide for the reconstruction, straightening and improvement of the Jack Rabbit Trail.

ROUTE 20, TRINITY LATERAL

(Redding to Arcata)

TRINITY COUNTY—Over Oregon Mountain, \$100,000, for grading. This allotment contemplates the improvement of a portion of this highway west of Weaver-ville.

TRINITY COUNTY—South Fork to Burnt Ranch, portions, 10.3 miles, \$123,500, for grading and surfacing. This present section of highway is a one-way road, very dangerous for traffic and is to be widened and improved.

ROUTE 21, FEATHER RIVER ROAD

(Oroville to Quincy)

BUTTE COUNTY—Jarboe Pass to Bardees Creek, 4 miles, \$425,000, for grading. This project and the next are both on the Feather River Highway and a part of the progressive improvement and construction necessary for opening this road to traffic.

PLUMAS COUNTY—North Fork Feather River, \$32,000, for the construction of a bridge.

ROUTE 23, EAST OF SIERRA HIGHWAY

(Saugus to Markleeville)

LOS ANGELES COUNTY—Saugus to Williams' Ranch, portions, 0.6 mile, \$37,000, grading, paving and bridge construction. This and the following project contemplate correction of inferior alignment and resurfacing of the existing pavement.

LOS ANGELES COUNTY—Williams' Ranch to Seeley's Ranch, portions, 1.4 miles, \$70,000, for grading and paving.

LOS ANGELES COUNTY—The Oaks to Acton Road, 10.6 miles, \$152,000, for paving. The old pavement is in poor condition, requiring large maintenance expenditure and should be resurfaced.

LOS ANGELES AND KERN COUNTIES—Lancaster to Mojave, 24 miles, \$220,000, for grading and paving. The present road is 15 feet wide, of thin type pavement and should be resurfaced and widened.

INYO COUNTY—South limits of Bishop to Birchim Canyon, 13.1 miles, \$170,000, for grading and surfacing. The present road and surface are inadequate to properly serve traffic.

Mono County

Crestview to 2.2 miles south of Rush Creek, \$181,000, for grading and surfacing. The existing highway is on inferior standard, lies in snow country and requires reconstruction and surfacing to make it adequate for traffic.

Mono Inn to 2.7 miles south, 2.7 miles, \$63,000, for grading and surfacing. This is a continuation of the improvement being carried northward in Mono County and will provide adequate standards for traffic, including surfacing of the road at present inadequate.

Sherwin Hill to Whiskey Creek, 3.5 miles, \$35,000, for grading and surfacing. This is another section of narrow and inadequate road which should be brought to proper standards.

Point Ranch to Dressler's Corner, 6.3 miles, \$117,180, for grading, surfacing and construction of bridges.

ALPINE COUNTY—Centerville Bridge to Markleeville, 6.6 miles, \$230,000, for grading, surfacing and construction of bridges.

ROUTE 24, SAN ANDREAS LATERAL

SAN JOAQUIN COUNTY—Lodi to Waterloo Road, 4.4 miles, \$121,000, for grading and paving. This section will carry improved construction from Waterloo Road into Lodi, connecting with the section built during the current biennium.

ROUTE 26, LOS ANGELES TO EL CENTRO

(Via Ontario, Colton, Redlands)

LOS ANGELES COUNTY—At Del Monte, \$90,000, for grade separation.

LOS ANGELES COUNTY—Orange Avenue to Barranca Street, 4 miles, \$180,000, for grading and paving. This project carries forward the improvement now underway toward opening this important highway between Pomona and Los Angeles.

SAN BERNARDINO COUNTY—Ontario to Pomona, 2.1 miles, \$110,000, grading and paving. This project and the following one are sections of the so-called Valley Boulevard, the heavy traffic artery on which the present pavement is too narrow and light to properly serve traffic.

SAN BERNARDINO COUNTY—Sierra Avenue to Colton, 5.8 miles, \$200,000, for grading and paving.

SAN BERNARDINO COUNTY—San Timoteo Creek, \$38,000, for construction of a bridge and the grading and paving of the approaches. This bridge in its present position is inadequate to carry the storm waters, is of temporary construction and should be replaced.

RIVERSIDE COUNTY—Banning to Whitewater, 12.1 miles, \$70,000, for repairing dips. Many of these dips are sharp and abrupt and are dangerous for fast moving traffic. They are to be corrected.

RIVERSIDE COUNTY—South Boundary to Avenue 62, 14.3 miles, \$14,300, for surfaced shoulders. Oil adjacent to the pavement is sandy and dangerous for traffic turning out from the pavement. Surfaced shoulders are to be constructed to correct this condition.

IMPERIAL COUNTY—Trifolium Canal to 20-foot pavement, 3.2 miles, \$80,800, for grading and paving. The present narrow pavement, 16 feet in width, is to be widened to 20 feet.

IMPERIAL COUNTY—Arroyo Salado, Tule, Campbell Washes, and San Felipe Sand Dunes, \$80,700, for bridge construction and grading and paving. These bridges need reinforcement to carry the heavy truck loads operating between Imperial Valley and the Metropolitan Area.

IMPERIAL COUNTY—San Felipe Wash, \$20,000, for bridge construction. The present bridge is dangerous and inadequate and must be reconstructed.

IMPERIAL COUNTY—Trifolium Canal to North Boundary, 33 miles, \$93,000, for surfaced shoulders. Sandy soil adjacent to the pavement is dangerous to traffic.

ROUTE 27, EL CENTRO TO YUMA HIGHWAY

IMPERIAL COUNTY—Holtville to Highline Canal, 7 miles, \$28,000, for surfaced shoulders. On this project and the following one, surfaced shoulders are to be constructed to correct the hazardous condition which the sandy material outside of the pavement creates.

IMPERIAL COUNTY—East Highline Canal to Sand Hills, 21 miles, \$590,000, for grading, paving and surfaced shoulders. The pavement which is rough and broken is to be resurfaced in addition to surfacing shoulders.

IMPERIAL COUNTY—Araz to Yuma, 6.1 miles, \$6,100, for surfaced shoulders.

ROUTE 28, REDDING-ALTURAS LATERAL

SHASTA COUNTY—Diddy Hill to Montgomery Creek, 16.2 miles, \$55,000, for surfacing. This will provide a surfacing for the graded road now under construction or being completed.

MODOC COUNTY—Alturas to Cedarville, portions, 2.6 miles, \$81,000, for grading and surfacing. This provides for the improvement of a portion of the low standard and inadequate roadway over Cedarville Mountain.

ROUTE 29, RED BLUFF-SUSANVILLE LATERAL

TEHAMA COUNTY—Red Bluff to Dales, 13.8 miles, \$485,000, for grading and surfacing. This provides for the improvement of the remaining section on this lateral not yet constructed or brought to modern standards.

ROUTE 32, PACHECO PASS LATERAL (Califa to Gilroy)

MERCED COUNTY—West Boundary to foot of Pacheco Pass Grade, 3.3 miles, \$260,000, for grading and surfacing.

MERCED COUNTY—Santa Rita Slough and approaches, \$29,000, for the construction of a bridge and grading and paving of approaches. The present bridge is dangerous and inadequate and must be replaced.

ROUTES 37 AND 38, AUBURN-TRUCKEE HIGHWAY

(Victory Highway, Auburn to the Nevada State Line)

NEVADA AND PLACER COUNTIES—Yuba River to Soda Springs, 11 miles, \$25,000 for surfacing. The present surfacing in this heavy snow country is inadequate and failing and needs to be reinforced.

NEVADA COUNTY—West End Donner Lake to Route 38, 4.7 miles, \$160,000, for grading and surfacing. This is one of the remaining short sections on this important highway which has not yet been constructed to modern standards.

NEVADA COUNTY—Hinton to 5 miles easterly, 5.0 miles, \$100,000, for grading and surfacing. The present surface on this section between Truckee and the Nevada State Line is failing and must be reinforced.

ROUTE 38, LAKE TAHOE HIGHWAY (Meyers to Truckee)

PLACER COUNTY—Ward Creek Bridge and approaches, \$14,000, for the construction of a bridge and approaches. This bridge is dangerous and narrow and must be reconstructed.

ROUTE 40, TIOGA PASS LATERAL

MONO COUNTY—Yosemite Park Boundary to Mono Lake, portions, 15.3 miles, \$248,125, for grading.

ROUTE 43, NEWPORT TO SAN BERNARDINO MOUNTAINS LATERAL

SAN BERNARDINO COUNTY—Fawnskin easterly, 1 mile, \$25,000, for grading and surfacing. Sharp

curvature, poor alignment and narrow width of roadway produce hazards on this short section which is to be corrected.

SAN BERNARDINO COUNTY—San Bernardino to Arrowhead Springs, 1 mile, \$40,000, for grading and surfacing. This will carry the construction and reconstruction of this road to the city of San Bernardino.

ORANGE COUNTY—Santa Ana Canyon, portions, \$200,000, for grading and paving. This is to correct poor alignment in the canyon and to resurface existing pavement which is failing.

ROUTE 46, KLAMATH RIVER LATERAL

HUMBOLDT AND SISKIYOU COUNTIES—Weitchpec to Happy Camp, portions, \$100,000, for the construction of bridges and grading. Many of the old wooden bridges on this lateral are in dangerous condition and must be reconstructed.

ROUTE 48, McDONALDS TO NAVARRO LATERAL

MENDOCINO COUNTY—McDonalds to Navarro, portions, \$60,000, for grading, surfacing and construction of bridges. This allotment contemplates the reconstruction or construction of new bridges in place of the present dangerous and inadequate structures.

ROUTE 49, CALISTOGA-LOWER LAKE HIGHWAY

LAKE COUNTY—Middletown to 4 miles northerly, 4 miles, \$223,500, for grading, surfacing and construction of bridges.

ROUTE 53, RIO VISTA LATERAL (Lodi to Fairfield)

SOLANO COUNTY—At Fairfield, 0.7 mile, \$20,000, for grading and surfacing. The present connection entering Fairfield is hazardous and dangerous, crossing several railroad tracks and making a blind intersection. It is to be corrected.

ROUTE 56, CARMEL-SAN SIMEON HIGHWAY

MONTEREY COUNTY—Carmel to Carmel River, 1.5 miles, \$101,000, for grading, surfacing and construction of a bridge.

MONTEREY COUNTY—Big Sur to Molera Ranch, 4.7 miles, \$170,000, for grading. This is one of the incomplete sections which must be constructed to open the road to traffic.

MONTEREY COUNTY—South Boundary to Molera Ranch, \$307,500, for the construction of bridges. A large number of bridges on the sections being graded by convict labor must be constructed to make the road usable.

ROUTE 56, CUYAMA LATERAL

KERN COUNTY—Maricopa to West Boundary, 10.5 miles, \$250,000, for grading and surfacing. This section out of Maricopa over the summit to the county line is to be constructed to proper standards.

ROUTE 58, BAKERSFIELD-MOJAVE LATERAL

KERN COUNTY—Haypress Canyon to Bear Mountain Ranch, 6.0 miles, \$400,000, for grading and surfacing. This construction will replace the portion of the present road which is on lowest standards of grade and alignment.

ROUTE 59, CAJON TO LANCASTER LATERAL

SAN BERNARDINO COUNTY—Camp Cajon to West Boundary, 18.0 miles, \$240,000, for grading and surfacing. This allotment is to provide a connection and open this road to traffic on direct alignment.

ROUTE 60, ROOSEVELT HIGHWAY

(Serra to Oxnard)

LOS ANGELES COUNTY—Los Angeles west city limits to Beverly Boulevard, 0.6 mile, \$100,000, for grading, paving and structures. This and the following projects on this highway are to provide for necessary grading and paving to bring this road to an adequate standard to serve the large volume of traffic. This is one of the most heavily traveled roads in the State.

LOS ANGELES COUNTY—West Channel Road to Santa Monica, 0.2 mile, \$20,000, for grading, paving and structures.

LOS ANGELES COUNTY—Ramirez Canyon to Encinal Canyon and Las Flores Canyon to Winter Canyon, 8.8 miles, \$502,500, for grading, paving and construction of bridges.

LOS ANGELES COUNTY—Winter Canyon to Ramirez Canyon and Encinal Canyon to West Boundary, 10.8 miles, \$821,500, for grading, paving and construction of bridges.

VENTURA COUNTY—East Boundary to Little Sycamore Creek, 1.2 miles, \$35,000, for grading, paving and construction of bridges.

VENTURA COUNTY—At Big Sycamore Creek, 0.6 mile, \$65,000, for grading, paving and construction of bridge.

VENTURA COUNTY—Oxnard to Calleguas Creek, 8.1 miles, \$166,000, for grading, paving and bridge construction.

ROUTE 61, ARROYO SECO ROAD

LOS ANGELES COUNTY—Colby Canyon to Mt. Wilson Road, 4 miles, \$420,000, for grading and surfacing. This construction will carry a completed road to Red Box Divide, connecting with the Mt. Wilson Road.

ROUTE 62, SAN GABRIEL CANYON ROAD

LOS ANGELES COUNTY—San Gabriel Canyon, \$113,000, State's share of cooperative grading. The major portion of this road is being constructed by Los Angeles Flood Control, City of Pasadena and the Forest Service to clear the proposed dams to be constructed in this canyon, the State participating to the extent of this allotment in work north of this construction.

ROUTE 64, INDIO-BLYTHE HIGHWAY

(U. S. Route 60)

RIVERSIDE COUNTY—Colorado River Bridge, \$4,688, State's share on the interest of the purchase of the bridge.

RIVERSIDE COUNTY—Near Shaver's Summit westerly, 12.0 miles, \$20,000, for oil surfacing.

RIVERSIDE COUNTY—Inyo to 12.5 miles easterly, 12.5 miles, \$300,000, for grading and surfacing.

RIVERSIDE COUNTY—Black Butte to Blythe, 9.3 miles, \$52,000, for grading and surfacing. The present surfacing on this road is failing due to inadequate thickness and must be strengthened.

ROUTE 65, MOTHER LODE HIGHWAY

EL DORADO COUNTY—Greenwood Creek and approaches, \$7,500, for construction of a bridge and grading of approaches.

CALAVERAS COUNTY—San Andreas to Angels, portions, 9.4 miles, \$120,000, for grading, surfacing and bridge construction. This allotment will complete the construction of the section of highway between San Andreas and Angels Camp.

ROUTE 68, BAY SHORE HIGHWAY

SAN MATEO COUNTY—In South San Francisco, \$150,000, for grade separations.

CASITAS PASS ROAD

VENTURA COUNTY—Casitas Pass Road, portions, \$150,000, for grading.

ROUTE 77, INLAND ROAD

RIVERSIDE COUNTY—South Boundary to Corona, 45 miles, \$45,000, for surfaced shoulders.

ROUTE 78, POMONA TO TEMECULA HIGHWAY

RIVERSIDE COUNTY—Elsinore to Box Springs Grade, 25.0 miles, \$25,000, for surfaced shoulders.

ROUTE 80, SAN MARCOS PASS ROAD

SANTA BARBARA COUNTY—Santa Barbara to San Marcos Pass, 5.7 miles, \$500,000, for grading and structures. The present dangerous, crooked and steep San Marcos Pass Road is to be reconstructed.

REPORT ISSUED ON SALINITY CONTROL

(Continued from page 27)

tively and practically solving the salinity problem. The studies show that salinity can be positively controlled by stream flow so as to prevent any harmful saline invasion into the Sacramento-San Joaquin Delta. The plan proposed for controlling salinity by stream flow will maintain a dependable and adequate fresh water supply in the delta channels for the full consumptive demands of the delta. The delta channels will then provide a dependable nearby source for diversion of fresh water supplies, now or hereafter made available therein, for the needs of industrial, municipal and agricultural developments in the upper bay region. If the proposed plan of control is adopted and put into effect, the present salinity menace to the delta will be removed and the salinity conditions in the upper bay and lower delta channels will approach the equivalent of those under natural conditions.

The report contains 440 pages and is well illustrated by 82 plates and graphs. Copies may be obtained through the Bureau of Publications and Documents, Capitol Building, Sacramento, California.

Two spinsters were discussing men—

"Which would you desire most in your husband—brains, wealth, or appearance," asked one.

"Appearance," snapped the other, "and the sooner the better."—*Georgia Highways*.

"Your teeth are in bad shape," said the dentist to a patient. "You should have a bridge put in at once."

"How much will a bridge cost?"

"About seventy-five dollars."

"Say, doc, can't I get along with a small culvert?"—*The Highway Magazine*

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C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample

MAP SHOWING STATE HIGHWAY SYSTEM

LEGEND

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Route 31 - Mojave Desert
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Official Journal of the Department of Public Works
MARCH State of California 1933

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\$45,000,000 in Contracts to Start San Francisco -- Oakland Bay Bridge

First Bids Opened by Governor Rolph at Ceremonies
in State Capitol February 28 for Building
West Bay Crossing Substructures

THE greatest single construction job to be launched in the United States this year was brought near the stage of actual construction on February 28, when Governor James Rolph, Jr., opened bids for the first contract on the \$78,000,000 San Francisco-Oakland Bay Bridge.

This contract calls for the construction of the substructures for the West Bay Crossing, supporting the suspension type bridge between San Francisco and Yerba Buena Island. The eyes of the engineering world were directed upon this contract, for it entails the pouring of concrete at a depth below water greater than heretofore attempted. While there are no unusual engineering risks attached to this job, yet it will establish a new record in the pouring of concrete some 218 feet below the surface of San Francisco Bay. The deepest point at which concrete has been poured below water to date is approximately 185 feet.

The ceremonies attending this historic step were simple. Mayor C. H. S. Bidwell of Sacramento welcomed the visitors to the Capitol City and Mayor Angelo J. Rossi of San Francisco and Dr. John F. Slavich, Vice Mayor of Oakland, together with other representative officials and State leaders, made brief speeches on the occasion. Those who spoke included: George J. Presley, Executive Vice

President of the San Francisco Chamber of Commerce; John M. Bonner, President of the Oakland Chamber of Commerce; Senator Roy Fellom, Senator Arthur H. Breed, James Reed, Manager of the Golden Gate Bridge District; Lieutenant Governor Frank F. Merriam; Speaker Walter J. Little; Rear Admiral G. W. Laws, Commandant United States Twelfth Naval District; Joseph R. Knowland, a member of the Financial Advisory Committee of the San Francisco-Oakland Bay Bridge; and His Excellency the Governor, James Rolph, Jr.

TWO MILLION SAVING

Four bids were submitted on the contract for the West-Bay substructure. One bid did not conform to proposal requirements and was rejected. The bids opened were as follows:

Trans-Bay Con. Co., \$6,957,100.68
Bridge Builders Inc., \$7,278,014
Silas Mason Co., \$8,311,653

The low bid represents a saving of over \$2,000,000 on estimated cost of \$9,000,000.

Certified checks accompanying the bids totaled \$2,675,000.

ASSEMBLY CHAMBER THRONGED

The Chambers of the Assembly in the State Capitol were filled to capacity with members of both branches of the Legislature and representative Californians when Governor Rolph, assisted by Earl Lee Kelly, State Director of Public Works, and Charles H. Purcell, Chief Engineer of the San Francisco-Oakland Bay Bridge, opened the bids submitted by outstanding contracting firms.

SIX CONTRACTS READY

In order that the utmost number of men may be employed at the earliest moment, Governor Rolph has ordered that work be started on as many sections of the bridge simultaneously as possible. In accordance with this injunction from the Governor, Director of Public Works Kelly and Chief Engineer Purcell provided for the opening of bids on six different contracts on February 28,

(Continued on page 8)

Abolishing Sausalito Bottleneck Will Save 460,000 Car Miles, 46,000 Hours Yearly

By JNO. H. SKEGGS, District Engineer, District IV

WITH construction now under way on the Waldo-Sausalito section of the Redwood Highway, next summer will see the completed improvement and realignment of what is perhaps the most thoroughly disliked short section, in so far as the traveling public is concerned, of heavily traveled highway to be found anywhere in the State.

Not only is the present road narrow, providing accommodation for two traffic lanes only, but it abounds in right angle turns and short kinks which make it impossible for the motorist to see more than 50 feet ahead at these locations, and positively prevents any passing of vehicles going in the same direction.

This condition of congested traffic is greatly accentuated due to the fact that this is the terminal stretch approaching the ferries at Sausalito, which run regularly on 20-minute service. Every 20 minutes finds a ferry load of automobiles freely interspersed with mammoth milk and produce truck trains en route to Marin dairies or Petaluma poultry districts, released to proceed northward; while a similar, though not so closely jammed caravan, proceeding in the opposite direction, approaches the ferry periodically, heading for San Francisco.

The regular ferries between San Francisco and Sausalito carry from 80 to 90 automobiles and trucks, and such is the length of the average northward procession of cars. During the summer months, particularly on Sundays and holidays, the ferry service is increased to as high as fifteen to sixteen ferries per hour, carrying an average of 50 vehicles per ferry; at which time, the caravan of vehicles in both directions becomes a continuous compact slow-moving procession.

For both average and maximum traffic,

however, the first truck or car regulates the pace of the entire column, and the resulting impatience of motorists bound northward, by the time they have turned the corner of Nevada and Bolinas Avenue, is usually so great that they become more or less reckless in passing and cutting in on this narrow stretch; and it is not until they have passed the limits of the present project at Waldo Point that they find real relief on the 40-foot surfaced width of improved highway to the north.

This condition of restriction is intensified by parked automobiles and pedestrian travel, since no well-planned provision has been made for either along the present route.



JNO. H. SKEGGS

FILLS IN MUD FLATS

The present project offers the most varied problems of construction, engineering and economics. From the construction and engineering standpoint, there are involved the difficulties of sinking fills through over 40 feet of mud in the tide flats adjacent to Bolinas Avenue.

The greatest depth of mud is encountered between Monterey and Eugene Streets, adjacent to Bolinas Avenue, a natural settling basin for a large drainage area to the west, where it is reported that deep sea vessels once landed. Here the present roadway has subsided to such an extent that it is inundated approximately one foot by the occasional extreme high winter tides, and the adjacent spur track of the Northwestern Pacific Railroad to the Mason Distillery is repeatedly washed out.

The project called for the removing, rehabilitating or demolishing of some fifty-four buildings, reconstructing public utility pipe lines, caring for industrial waste lines without interruption of operation, reconstructing

(Continued on page 12)



No. 1—Beginning of fill across tidal flats of Richardson Bay near Waldo Point. Dotted line shows approximate new alignment adjacent to present Bolinas Avenue across a natural settling basin where fill must be sunk through 40 feet of mud. New route cuts through hills in background.

* * *



No. 2—This close-up view of the fill started across the tidal flats shown in the above picture illustrates some of the difficulties the engineers are encountering with the 40-foot of mud overlaying the fill foundation. Tons of displaced mud carrying large rocks from the main body of the fill are being forced to the surface.

* * *



Nos. 3-4—The terminal stretch of the Redwood Highway approaching the ferries in Sausalito is a narrow two-lane way abounding in right angle turns, each a danger point because of greatly restricted vision. Two of these are shown in picture No. 3 while No. 4 shows how a truck and trailer can hold up the whole parade.

* * *



No. 5—On Saturdays and Sundays in summer 16 ferries per hour averaging 50 vehicles each add 800 cars and trucks to the northward procession through Sausalito usually encountering a similar southward procession bound for San Francisco.



Bridges of Ridge Route Alternate Typify Latest Engineering Advances

By W. B. JAMES, Assistant Construction Engineer, Bridge Department

THE advanced technique in modern highway design and construction is illustrated in the four bridges over Piru Creek on the Ridge Route Alternate in Los Angeles County, now under construction. In the early days a highway bridge was regarded as more or less an independent unit or link in the route and the highway was just built up to it. Curvature was something to be avoided and only in cases of actual necessity was it ever even considered.

A grade on a bridge was likewise something out of the ordinary. That was taken care of in the approach or approaches. As for a superelevation on a bridge, that was something not even thought of. About the only deviation from a straight away was a skew, and bridges were rarely built that way.

In present day highway design the highway bridge is considered as an integral part of the roadway. With the development of high speed traffic, curvature, grade and superelevation are important elements in the technique of design. If a bridge happens to be on a curve in the alignment of the roadway it is made to conform to the radius of curvature. If it is on a grade it conforms to the grade. And if the curve has a radius which calls for superelevation that is taken care of in the design and construction of the bridge.

LAST WORD IN DESIGN

The Ridge Route Alternate is designed for fast traffic. It is being built to obviate the dangerous curves and grades and high altitude of the present Ridge Route over the mountains. The Alternate is, therefore, the last word in modern highway design with a roadway carried through deep cuts and over deep fills and bridging meandering streams to secure the most feasible direct route.

All four of the Piru bridges are built on grades, three of them on curves and one part curve, and one on a vertical curve as well as a horizontal curve. On one of them built with a curvature of 1000-foot radius there is a superelevation of the roadway of three feet.

All four of the Piru Creek bridges are of the same general type, with concrete piers

and abutments and steel plate girders and steel floor beams carrying a reinforced concrete deck. The main spans are 80 feet with lesser ones 50 and 60 feet in length. The 80-foot girders are 7 feet in depth and the 50-foot girders are 5 feet in depth. They are heavily braced. Under an optional specification 22-inch Bethlehem steel beams are being used for floor beams. They are spaced 10 feet on centers with the ends projecting over the girders, which are set 26 feet apart on centers.

ROADWAYS THIRTY-FOUR FEET WIDE

The concrete decks are 9½-inch thick, reinforced longitudinally with ½-inch round bars. Expansion joints are placed approximately 20 feet apart. The roadway is 34 feet in width between the curbs on either edge of the deck. All the bridges will have guardrails of redwood with the posts set in the curbs.

Concrete slope paving is provided for protection of the abutments on all the bridges. This is carried to a height of about 20 feet to take care of a maximum flood of about 15 feet.

The bridges are designated by the stations at which they are erected. The one at Station 31, the farthest south, is 250 feet long and consists of three 80-foot spans. It is built on a curve with a radius of 2600 feet and has a grade of 1.44 per cent. The piers and abutments average about 50 feet in height. Excavation was carried through boulders to a depth of about 15 feet below the stream bed where a good foundation of shale rock was found.

The bridge at Station 122 is 290 feet long and consists of three 80-foot spans and one 50-foot span. This structure has a grade of 1.97 per cent and is built with a curvature of 1000-foot radius.

SUPERELEVATED BY FILLETS

On this bridge the roadway has a superelevation of 3 feet. This will be produced by constructing concrete fillets on the under side of the concrete deck slab and extending along the top of the steel floor beams which are set level, this fillet tapering from 3 feet on the outside of the curve to zero at the

(Continued on page 17)



LIKE ORIENTAL SHRINES extending up the rugged canyon in groups these bridge piers looked when this photograph was made of the construction projects along the Ridge Route Alternate in Piru Gorge. Four bridge sites are visible in the picture as indicated by arrows.



MASSIVE PREPARATIONS are here shown for a bridge in Piru Gorge. The slope of the huge fill is paved to protect the embankment and piers are being built through boxes extending down to the foundations.

Test Made of Aerial Photography to Speed Topographic Mapping Program

By **EVERETT N. BRYAN**, Supervising Hydraulic Engineer

CAN THE aeroplane and camera be profitably substituted for the plane-table to speed the topographic mapping program of California? That is the question for which the State Engineer's office and the office of the U. S. Geological Survey are now seeking an answer. With 75,000 square miles, or nearly half the area of the State to map, and appropriations for the work such that with the use of standard ground methods it will probably require 14 years to complete the job the engineers in charge have set out to find whether or not aerial methods should be substituted in whole or in part.

While stereo-topographic mapping processes have been successfully employed for some years both in this country and abroad in the production of large scale maps the small image angle and long focal distance of existing cameras have prevented the profitable application of aerial methods to the production of topographic maps of scales of 1:62500 and smaller, such as are standard with the U. S. Geological Survey.

AN AERIAL EXPERIMENT

Accordingly when a comprehensive program was adopted by the State Engineer's office and the U. S. Geological Survey in September, 1931, looking toward the topographic mapping of all unsurveyed areas in California, and the revision of existing topographic maps which were altogether obsolete and unsatisfactory, it was determined to experiment with a view to evolution of some aerial method which might be successfully employed to speed the program.

The Lakeport quadrangle was selected for the test because fairly representative of the varying conditions which are experienced throughout the State in the way of altitude, topography, and vegetative cover. It is a 15-minute sheet covering some 238 square miles and centers approximately 100 miles north of San Francisco. The altitude ranges from a minimum of 1300 to a maximum of 5000 feet above sea level, the topography ranges from bold to moderate, and the vegetative cover varies from dense to barren.

A contract for the aerial work was let to the Curtis Wright Flying Service of Glendale

who used a Curtis Wright Robin plane with Challenger motor, which had seen similar previous service in the vicinity of Memphis and Kansas City. The Geological Survey furnished a Hugerhoff camera and German film, the contractor being bonded for \$4,700 to insure against loss of the camera or damage thereto. Alameda airport approximately 100 miles to the south was used as a base and weather reports were furnished through the courtesy of the U. S. Forest Service. Lt. Col. H. A. Erickson did the engineering and photographic work and Mr. J. M. Meniffee acted as pilot.

Flying started August 20, 1932, was completed one week later, and the films were shipped September 1st. It required only 14 actual flying hours, the work being hampered by prevalence of forest fires. On one day 32 different fires were counted.

AT FREEZING HEIGHTS

The work was done at an elevation of 10,000 to 13,500 feet, the elevation being checked by Paulin altimeter in conjunction with centigrade thermometers. As is commonly the case in similar work some difficulty was experienced with the cold, Col. Erickson freezing one heel on the last day of operations.

It required 455 negatives or approximately two exposures per square mile to complete the job. The films were immediately dispatched to the headquarters office of the Geological Survey at Washington, D. C., where some 450 points were spotted on the prints for which the elevation must be determined by ground methods, and in 200 cases the position as well. The method tested does not materially reduce the ground work in connection with horizontal and vertical controls but the need for sketching contours in the field is eliminated.

A complete record of the cost is being kept and the results will be carefully checked as to accuracy, speed and economy. If a successful method is evolved it may be possible to speed California's topographic mapping program.

Nannette—"I caught my husband flirting."
Jeannette—"That's how I got mine, too."



AERIAL MAPS of Lakeport quadrangle—Upper photo of Blue Lakes region shows how a slide dammed up this gorge and caused the origin of Clear Lake pictured below. Inset of Lt. Col. Erickson, photographer, and Pilot Menifee.

Bay Bridge Entirely Self-Liquidating

(Continued from page 1)

March 7, March 8, March 28 and March 29, calling for the construction of the major portion of the entire bridge project. These contracts will total approximately \$45,000,000. Work will start, it is estimated, by May 15, employing an average number of 6500 men during the course of construction.

In opening the bids on the first contract Governor Rolph pointed out that this project, the greatest to be launched in the United States this year, is entirely self-liquidating and will not burden the taxpayer to the extent of one additional dollar.

"So great is the project," Governor Rolph said, "that the steel industry estimates that 6.7 per cent of the entire steel output of the United States in 1933 will be used by the San Francisco-Oakland Bay Bridge."

CITIES WILL CHANGE

The effect upon San Francisco and Oakland of the improved transportation to be brought by the bridge was the subject for speculation by Governor Rolph, Joseph R. Knowland and other speakers. San Francisco, it is believed by traffic engineers, is destined to become a city of skyscrapers, and single family dwellings are almost certain to be eventually crowded out. Oakland and its suburban areas, it is predicted, will increase in residential population and the residential areas will extend far back into the East Bay Hills as the average San Franciscan comes to select his home as far as 20 miles from his work. The easy traffic movement from San Francisco to Oakland will, it is believed, unify the communities around the bay.

The ceremony attending the bid opening was a state-wide event, managed by the Governor's Committee for the Opening of Bids, which consisted of civic leaders from all parts of California.

Director Kelly in describing the magnitude of the project said:

VISIONING MATERIAL MASSES

"The bridge will require 30,000,000 board feet of lumber, or sufficient to build 3000 five-room dwellings, estimating 10,000 feet of lumber to a dwelling.

"The concrete and steel utilized in the bridge would build 35 Russ Buildings (San Francisco), 35 City Halls (Los Angeles), or more than 35 L. C. Smith Buildings (Seattle).



FIRST BID opened by Governor James Rolph, Jr., on a construction contract for the San Francisco-Oakland Bay Bridge is handed to Chief Engineer C. C. Purcell for tabulation while Director of Public Works Earl Lee Kelly assists at the proceeding.

"Individual towers supporting sections of the bridge are more than 500 feet high from their base in the rock below the surface of the bay to the top, and each represents a greater construction job than any skyscraper on the Pacific Coast.

LINKS TWO COASTS

"Tourists from all over the United States will be attracted by the San Francisco-Oakland Bay Bridge, crossing this historic bay, and completing the last link in the Atlantic to Pacific Highway.

"The bridge is a self-liquidating project, financed out of its tolls, and does not add one dollar of property tax burden on the State of California."

The contract for the West Bay substructure, officially known as Contract No. 2, calls for the construction of five concrete piers between the San Francisco shore line and Yerba Buena Island.

The construction of these piers involves the building of great caissons in bay shipyards.



MAKING CALIFORNIA HISTORY: Men distinguished in civic, political and official life of State and Nation gathered in the Assembly chamber to open the first bids on the San Francisco-Oakland Bay Bridge project. Top row, left to right: Director Kelly, Senator Fellom, P. H. McCarthy, Senator Breed, Lieutenant Governor Merriam, Rear Admiral Laws, U. S. N.; Governor Rolph, Speaker Little, Mayor Rossi, San Francisco; Vice Mayor Slavich, Oakland; Mayor Bidwell, Sacramento; Vice President Presley, San Francisco Chamber of Commerce; President Meherin, Harbor Commission.

Lower row left to right, Attorney McKevitt, Highway Commission; Engineer Bock, A. J. McCleary, Mark Requa; Publisher Knowland, Oakland Tribune; Chief Engineer Purcell, Bridge Engineer Andrew, G. T. Gunston; Supervisor Roncovieri, Mayor Ament, Berkeley.

These caissons are like huge box-shaped ships with an area of half a city block.

They will be floated to the pier sites weighted down with concrete and sunk with an under-water concrete seal, open dredge method to form the foundations for the piers.

Each caisson has a cutting edge which is forced down through the mud and sand to rock bottom by the weight of the concrete placed in the cells of the caisson.

Each of these five piers will be a structure of skyscraper height and the larger piers will require as much concrete as a great modern office building.

The remaining major contracts on which bids were scheduled to be opened by March 8 are as follows:

Cont. No.	Covering	Est. Cost
4 & 4A	East-Bay Substructure.....	\$6,240,000
6 & 6A	West-Bay Superstructure.....	16,600,000
5	Yerba Buena Island Crossing.....	2,261,000
3	San Francisco Anchorage.....	1,580,000
7	East-Bay Superstructure.....	10,191,000

I know a woman who was so down-in-the-mouth, she had her face lifted.

"I see you've given up teaching your wife to drive."

"Yes, we had an accident."

"What happened?"

"I told her to release the clutch and she let go of the steering wheel."—*The Humorist*.

Adding 70 Miles to International Route

Another section of the International Pacific Highway in the State of Oaxaca, Mexico, some 410 miles south of Mexico City, is to be opened up for motor travel, according to recent official report.

The particular section to receive immediate attention says the report, extends for about 70 miles through a rough, mountainous region from the Rio Tehuantepec southeasterly to the Isthmus of Tehuantepec.

Oaxaca is the second State south of the State of Mexico, which includes the capital district. The report received declares that Oaxaca will proceed at once to open up all of the impassable stretches along the international route within its borders, starting with the 70-mile Tehuantepec strip.

It was a dark night and the motorist was lost. Presently he saw a sign on a post. With some difficulty he climbed the post, struck a match and read: "Wet Paint."

Collegiate: "I beg your pardon, Miss, but would you care to take a ride?"

Coed: "Sir! I'll have you know I'm a lady."

"Collegiate: "I know that. If I wanted a man, I'd go home and get my father."

Relocation of Bridge Saves \$40,000, Eliminates Four Grade Crossings

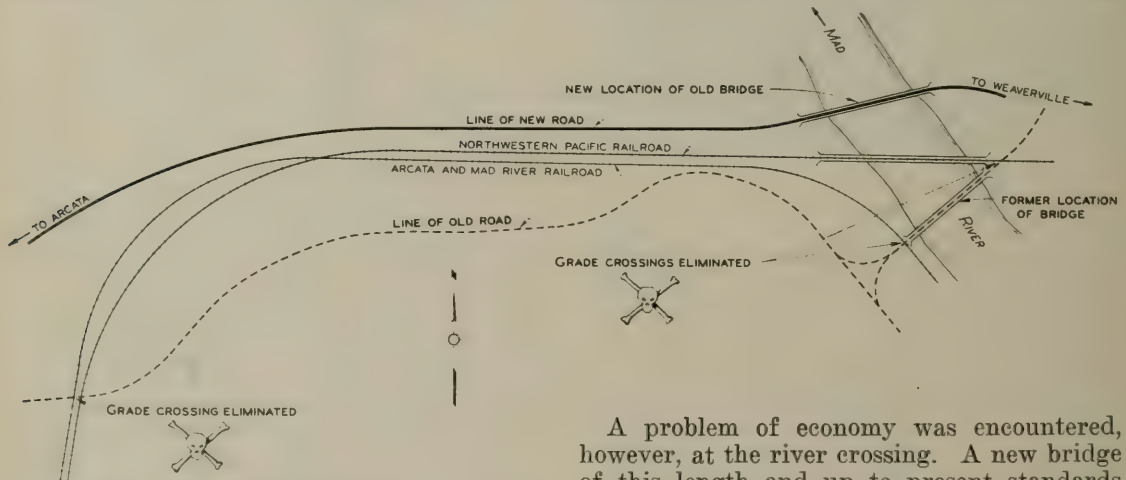
By GENE WELCH, Assistant Designing Engineer

AN example of the economical use of available material for the satisfaction of immediate and future requirements was the recent relocation of an old bridge over the Mad River near Arcata, Humboldt County.

In the earlier days of road building, the location of roads and bridges was governed not so much by standards of grade and alignment as by the contours of the ground and low construction cost. The old county road from Arcata to Mad River and up the river to the lumber town of Korbel followed closely the foot of the hills. The tortuous alignment

grade crossings with the Northwestern Pacific and the Arcata and Mad River railroads, respectively. At Mad River the stream was crossed with an old county bridge of 285-foot steel span with 15-foot roadway. This structure had railroad grade crossings at each end, both of which were blind. The hazard created by these railroad crossings made a very dangerous situation.

To correct this situation a new road has been constructed entirely on the north side of the railroads, as shown on the sketch, thereby eliminating four grade crossings and substituting wide curves for the short turns.



with sharp, blind curves and numerous railroad grade crossings had fallen far behind the present day standards expected by the motorists, even on secondary roads.

Since becoming a part of the State Highway System this road has been extended east to Weaverville and a connection with the road from Redding, thus forming a link between the Redwood Empire and the upper Sacramento Valley, and providing access to large recreation areas in Trinity and Humboldt counties. The traffic is largely seasonal and, except for some local trucking, is principally tourist or pleasure cars.

GRADE CROSSING MENACES

The old road had many curves with radii as short as 50 feet. There were two railroad

A problem of economy was encountered, however, at the river crossing. A new bridge of this length and up to present standards would cost at least \$50,000. Since the traffic on this route is comparatively small and the loads light, the possibility of using the old steel span was considered. It was found that although the old span had been in place for over 25 years and through exposure to salt air and fog had rusted badly in spots, it could be repaired and used for this crossing for many more years.

JOB LOOKED DIFFICULT

This plan was adopted and a contract was made for the removal and replacement of the span on new pile piers on the new line, some 250 feet downstream. This arrangement involved moving a 285-foot steel span over, under, or around a railroad bridge and setting it up on new piers. At first

Old Structure Was Skidded Down River To Another Crossing

thought the difficulties of moving such a large structure, and in addition crossing a railroad without blocking traffic, appear almost insurmountable.

Actually the work was accomplished quickly and easily by removing the connecting pins, taking down the truss members, piece by piece with tall gin poles, skidding the pieces down the river bar to the new site where they were hoisted into position and pinned.

Because of the efficient handling, the dismantling was completed in six days and the reerection in seven days. A small percentage of steel and the expansion rollers were replaced. A large percentage of the timber deck and timber in the approach spans was used at the new location so that only a small expenditure for new material was required.

The result of this procedure was that the State has provided a suitable bridge across the river, which will serve for many years, at a cost of about \$11,000 or a saving from the cost of a new bridge of about \$40,000. Such economies are not only in keeping with these times but would appear advisable at any time to avoid the waste of junking still serviceable material and to postpone the much greater investment for the permanent structure until actually required by traffic.

D. E. Marsh was the resident engineer.

DECREASE IN CHILD TRAFFIC DEATHS DUE TO EDUCATION

Definite evidence that the answer to the traffic accident problem lies in safety education is found in the decrease of 25 per cent in traffic deaths among children of school age in Los Angeles city and county last year, as compared with a mere 2 per cent reduction in motor vehicle fatalities among all persons.

This remarkable decline in number of children killed in traffic is shown in final figures just compiled by the Public Safety Department of the Automobile Club of Southern California. It means many young lives saved in the six-to-fifteen age classification, through instruction in traffic safety now conducted in the elementary and secondary schools.

Lawyer (handing check for \$100 to client who had been awarded \$500)—There's the balance after deducting my fee. What are you thinking of? Aren't you satisfied?

Client—I was just wondering who got hit by the car, you or me.

Rebuilt to Serve Future Generations



Practical economy is represented in this old Mad River Bridge moved to a new location, abolishing four railroad grade crossings.

Santa Barbara Line Changes Under Way

Surveys are in progress in Santa Barbara County for the reconstruction of a portion of the Coast Highway along the ocean between Tajiguas Creek and Arroyo Quemada, and from Arroyo Honda to one mile north of Gaviota, a total distance of 8 miles. The proposed changes are to correct unsatisfactory alignment and vertical curves on which the sight distance is so short as to be a menace to traffic.

Surveys are completed for the relocation of the Coast Highway over the Nojoqui Grade. This is to correct unsatisfactory alignment and grades.

Surveys are in progress for the reconstruction of a portion of the San Marcos Pass Road from the Summit of the San Marcos Pass to the city limits of Santa Barbara. This is a portion of the secondary road taken over from Santa Barbara County about two years ago.

FOUR NEW BRIDGES BUILT

On the Roosevelt Highway, the road has been reconstructed with a 20-foot oiled rock surface on a 30-foot roadbed between Cambria and one mile north of San Simeon, a distance of 9.7 miles.

Within the limits of the above project two steel and concrete bridges have been completed across San Simeon Creek and at Station 141. Two similar structures are under construction across Pico and Little Pico creeks.

Sixteen Curves Eliminated in 1.3 Miles

(Continued from page 2)

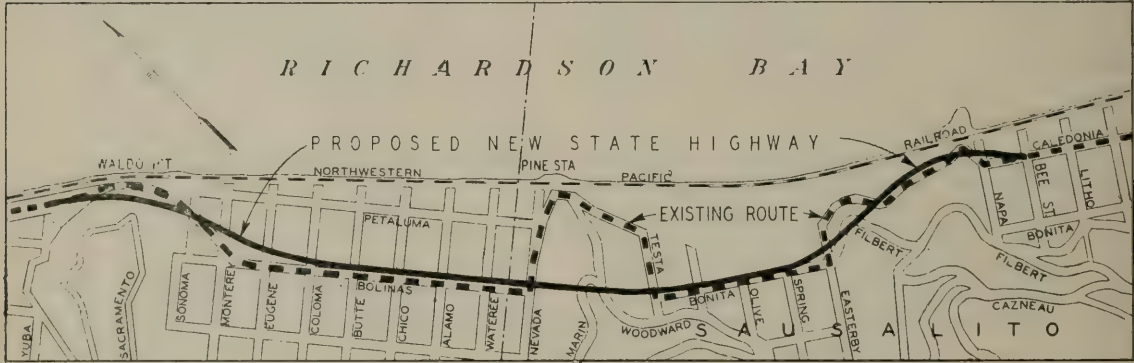
city streets to conform to the existing improvement, with all attendant problems inherent in constructing a boulevard or highway through a municipality.

ACUTE TRAFFIC PROBLEM

Furthermore, due to the crossing and recrossing of the existing route, the problem of maintaining traffic is an acute one. This is particularly true at Nevada Street, where the new grade is some 16 feet above the old one, and a temporary construction bridge must be built in order to insure no interruption to this heavy traffic.

curves, equaling $2\frac{1}{2}$ complete circle turns, with a maximum radius of 600 feet and a minimum prevailing radius of 50 feet. The new highway has only 6 curves, equaling one-half circle turn, with a maximum radius of 3000 feet and one curve of 500-foot radius; and, although the project is only 1.3 miles in length, it saves one-quarter mile in distance over that of the present route.

This road carries an average year-round traffic of over 5000 vehicles a day; and, while economic savings to its users might be subject to some discussion, due to wide variation in



The northerly 0.6 miles of the project is outside the city limits of Sausalito, 0.7 miles lying within the city limits. Approximately half the project is mountainous, the other half being across tide flats or marsh lands.

From the economic standpoint, the project appears to be a bold one until carefully analyzed. To widen the existing route would involve as much capital investment as the location chosen, due to the mountainous, shore-line character of the country traversed, and property improvements more or less concentrated along the existing location. The new route has utilized all possible salvage values of the existing highway, namely those portions along Bolinas Avenue, Bonita Avenue and Caledonia Avenue.

SIXTEEN CURVES ELIMINATED

The project under construction presents the following advantages over the old highway, the surface of which within the limits of Sausalito has reached such a state of wear and disintegration as to call for immediate resurfacing: the present highway has 22

costs of operating automobiles and commercial vehicles, the following figures are pertinent and interesting:

The new highway will save to its combined users:

- 460,000 vehicle miles of travel distance per year
- 40,000 gallons of gas per year
- 4,000 quarts of oil per year
- 120 automobile and truck tires per year
- 46,000 hours, or 5700 eight-hour days of vehicle time per year
- 92,000 hours, or 11,400 days of one person's time per year
- 3,650,000 complete circle vehicle turns per year

Peace of mind and general satisfaction of traveling a road paved 40 feet in width, with asphaltic concrete, and with 8-foot shoulders on either side, as against the present variable width, maximum two-lane, and confined crooked roadway—is a compensation for psychologists to figure, not engineers. Suffice it to say that from an economic standpoint this project is well justified, and from an engineering standpoint it is a logical, necessary and highly beneficial improvement.

Marketing of Fruits, Vegetables Increased by Motor Trucking

CONSUMPTION the year around of fresh fruits and vegetables by American families is climbing in many parts of the country to new peak levels with the increasing movement and distribution of these commodities over good highways by motor truck, according to data developed by the United States Bureau of Agriculture in a study, which is not yet complete, of the functions and efficiency of the motor truck in marketing.

According to the National Highway Users Conference, it is found that motorized transportation in the movement of these products is coming into direct competition with railroad facilities in only a limited degree. Much of the truck hauling is for short distances and in less than carload quantities over territories that surround the large markets and terminal points in the railroad handling of these products.

In its larger aspect, the truck movement of fruits and vegetables is found to be essentially a service that is supplementary and auxiliary to the transportation that is being provided by the railroads, and in its normal development, fitting into coordination with railroad facilities.

SHORT HAUL BUSINESS

The great bulk of the truck movement of fruits and vegetables is from farms and gardens to consuming centers of 100 miles or less distant, or from railroad concentration points over surrounding areas.

An additional fact brought out by the Bureau of Agricultural Economics in its survey is that the more perishable fruit and vegetable crops are moving by motor truck in greater quantities to large markets at a distance than are bulkier and less perishable products. This is attributed to more rapid and direct delivery to markets or consumers that can be made with motor trucks and to reduced loss in less frequent handling.

MOVING SECOND GRADES

While long distance movement of fruits and vegetables by motor truck is on the increase, especially from Florida and other southern States during the winter months, yet much of the movement is of secondary grades of fruits and vegetables which are seldom moved by railroad because of the high ratio of freight costs to prevailing market prices.

Projects Under Way on 20 Miles of Road in Monterey County

ON THE Coast Highway between 1 mile south and 6 miles south of San Ardo, the road is being reconstructed with a 20-foot reinforced concrete pavement on a 36-foot roadbed. This project is financed through the Federal Emergency Relief Construction Act of 1932. Work was started in January and the project is to be completed in June of this year.

On the Roosevelt Highway, between San Remo Divide and the Carmel River, a distance of 3.7 miles, the road is being reconstructed with a 30-foot and 36-foot roadbed with a surface of selected material, treated with bituminous binder, 22 feet in width by 4 inches thick. This project is through the Carmel Highlands, a highly improved residential section. The project is about 50 per cent complete.

Within the limits of the above project, there is under construction a reinforced concrete bridge across Wild Cat Creek, consisting of one 57-foot span and two 39-foot spans on concrete piers and abutments. The project is about 25 per cent complete.

Plans are in progress for the reconstruction of the Coast Highway between Camphora and Chualar, a distance of about 11 miles. The present pavement is too narrow to satisfactorily handle the traffic. The surface has become broken and the maintenance cost is running so high that economy dictates the necessity for an immediate improvement.

ACCIDENT TOLL REDUCED

BY 9500 LIVES IN 1932

A total of 9500 Americans were alive and well today who would have been killed if the accidental death rate had not been checked in 1932, the National Safety Council recently announced.

Motor vehicle deaths dropped more than 4200.

Public accidents dropped from 20,000 to 18,000. This classification includes drowning, firearms accidents, and the like.

Home accidents dropped from 29,000 to 28,000.

Industrial deaths dropped from 17,500 to 15,000.

These second grades are being handled in expanding quantities by motor truck, and, in many cases, finding wholly new markets and outlets in small towns and villages and in outlying industrial communities, where, in the past, citrus fruits and winter vegetables have had only a negligible consumption.

Seventeen Projects Put Under Way for Spring Work to Cost \$2,078,400

WITH the passing of the winter months the Division of Highways is bending its efforts to getting work under way early in the spring. It is planned to advertise 12 projects during March, which, with the 5 projects set under way during the month of February, make a total of 17 projects for the opening of the spring drive. These 17 projects involve the construction of 18.6 miles of permanent type of pavement, 24.8 miles of bituminous treated crushed gravel or stone surfacing, two bridges and two grade separation structures, and the total estimated cost of this highway improvement work is approximately \$2,078,400. A detailed list of the projects proposed and a summary of the work by types is given herein.

The following descriptions of a few of the more important of the proposed projects give details and the locations of the work covered by them.

On the Sacramento-Placerville lateral a new 40-foot roadbed is to be constructed and a 20-foot pavement placed between Mills and Nimbus, in Sacramento County, a distance of 4.5 miles. This improvement will extend the pavement placed a year ago between Sacramento and Mills to within a short distance of Folsom.

INTERSTATE ARTERIAL

This State highway not only serves the traffic into Placerville but also carries a large volume of recreational traffic to resorts in the American River Canyon and to Lake Tahoe as well as all interstate traffic using the Lincoln Highway. The section now to be improved follows the alignment of the existing road and will provide a highway with modern standards of grade and width.

Further improvement to the northerly section of the Bayshore Highway is noted with the advertising on February 28th for the paving of 3.1 miles of this route from the south city limits of San Francisco to South San Francisco in San Mateo County. While this section of the Bayshore was the first to be graded the placing of the pavement has been withheld until the heavy fills had reached their final settlement.

The work now to be undertaken will include

the placing of a 40-foot pavement on a sixty-foot roadbed, with the shoulders on each side of the pavement surfaced with bituminous treated crushed rock. The completion of this project and work now under way will provide a 40-foot pavement on this boulevard from San Francisco to Lawrence Station Road in Santa Clara County, with the exception of the 40-foot bituminous treated surface between San Mateo and Redwood City. The status of the 35 miles of this broad highway which is completed or under construction will then be 28 miles of pavement and 7 miles of bituminous treated crushed rock surfacing.

ELIMINATES "GRAPEVINE"

In Kern County a radical improvement of far-reaching effect is to be made to the section of the Los Angeles-Bakersfield arterial between Oak Glen and Grapevine Station, a distance of 3.7 miles.

This improvement involves construction of this section of State highway on a revised alignment which will eliminate from the system the crooked and notorious "Grapevine." The existing road has many short radius sharp curves. The present minimum radius being only 80 feet and the total curvature between these two points is 2183° or 6.1 complete circles. The revised alignment will provide a minimum radius of 1000 feet and the total curvature will be only 342° or less than one complete circle. The existing roadbed is graded to 24 feet wide while the proposed construction will provide a 36-foot road with a 20-foot pavement.

Another important improvement to the heavily traveled Golden State highway between Bakersfield and northern California is to be made between Goshen and Plaza Garage in Tulare County. This project involves the construction of the highway on revised alignment for a distance of 4.2 miles and is to be made in conjunction with the construction of a grade separation under the tracks of the Southern Pacific Railroad at Plaza Garage.

The new highway will pass to the westerly side of the railroad through the grade sep-

New Projects Advanced to Bids

The following list of improvements advertised by the Division of Highways last month and planned for advertising this month includes work in sixteen counties involving 2 bridges and 2 grade separations and road jobs totaling 43.4 miles.

ADVERTISED IN FEBRUARY

County	Location	Miles	Type
Sacramento	Mills to Nimbus	4.5	Pavement
Inyo	Bishop to Round Valley Road	7.0	Bit. Tr. Cr. Rock Surf.
Lake	Manila Ranch to Bartlett Springs Road	3.2	Bit. Tr. Cr. Rock Surf.
San Diego	Across San Diego River	640 ft.	deck plate girder bridge
San Mateo	San Francisco to South San Francisco	3.1	Pavement

PROPOSED MARCH ADVERTISING

Merced	Approaches to Merced River Bridge	0.9	Pavement
Kern	Oak Glen to Grapevine Station	3.7	Pavement
Los Angeles	At Brea Canyon Summit	1.3	Pavement
Tulare	Goshen to Plaza Garage	4.2	Pavement
Contra Costa	In Valona	0.2	Pavement
Fresno	Church Ave. to California Ave. in Fresno	0.7	Pavement
Lassen	Susanville to Johnstonville	2.0	Bit. Tr. Cr. Rock Surf.
Shasta	Redding to Jenny Creek	1.1	Bit. Tr. Cr. Rock Surf.
Placer	Gold Run to Airport	11.5	Bit. Tr. Cr. Rock Surf.
Lake	Across Morrison Creek	60 ft.	Rein. Conc. Slab. Br.
Santa Barbara	At Elwood		Overhead Grade Separation
Santa Clara	Near Morgan Hill		Madrone Crossing Gr. Sep.

SUMMARY

February and March

Type	Miles	Amount
Permanent Pavement	18.6	\$1,412,400
Bit. Treated Crushed Rock Surfacing	24.8	389,900
Bridges and Grade Separations	(4)	276,100
Total		\$2,078,400

Paving Finishes Interstate Lateral

(Continued from page 14)

aration and connect with the existing highway just north of Goshen. This improvement will eliminate two grade crossings from the State highway system—the one at Goshen and the crossing of the Hanford-Visalia lateral at Plaza Garage. The new highway will provide a graded roadbed 36 feet to 56 feet wide and pavement 20 to 40 feet wide. The grade separation will be constructed under a separate contract.

ALONG CLEAR LAKE

In Lake County the Ukiah-Tahoe Lateral is to be improved for a distance of 3.2 miles along the northerly shore of Clear Lake. This work will consist of constructing a graded roadbed 28 feet wide and placing a bituminous treated crushed rock surfacing 20 feet wide on a crusher-run base 22 feet wide. The project extends from Manila Ranch, 3.5 miles east of Upper Lake, to Bartlett Springs road 2.7 miles westerly of Lucerne. The work marks another step in providing an adequate surface on this highway which connects the coastal redwood country with the high Sierra.

The present project will complete the surfacing on this route between the Coast Route at Ukiah and the Pacific Highway at Williams with the exception of the 3.5 miles from Upper Lake to Manila Ranch and the 2.7 miles from the easterly end of this project to Lucerne. Both of these sections are in fair condition so that traffic will experience no difficulty on the portion of this cross-state road between the Redwood Highway and the Sacramento Valley.

Grading on the new alignment of the Sacramento-Truckee road between Gold Run and the airport, westerly of Emigrant Gap, is nearing completion and it is now proposed to place a 20-foot bituminous treated crushed rock surface on a crusher-run base on the 11.5 miles of new roadbed.

NEW ALIGNMENT

With the completion of this surfacing project the entire highway from Sacramento to the Nevada line, just west of Reno, will have been brought to modern standards of construction and surfacing. The new alignment of this portion of this important and heavily traveled interstate route leaves the existing road at Gold Run and, lying to the southeast

of the present road and railroad follows up the course of Canyon Creek. At Towle the highway passes under the tracks of the Southern Pacific Railroad via the new grade separation and then connects with the recently completed highway at the airport.

This lateral highway is one of the most important routes in northern California. It carries a large volume of interstate and transcontinental traffic which enters California via Reno. The history of the country which the route traverses is intimately associated with the earliest covered-wagon pioneering and settlement of the State, which in addition to its famed Sierra and Lake Tahoe scenery, draws thousands of vacationists and tourists.

The third unit in the cooperative improvement of the State highway routing along the West Atlantic Street Extension in the city of San Diego is noted by the advertising on February 7th of a project for the construction of a 640-foot deck-plate girder bridge on concrete piers and abutments with pile foundations across the San Diego River. Work is now under way on the construction of two smaller bridges, one across Cudahy Channel and the other across Tecolote Creek, and a contract has just been awarded for grading the roadbed between Barnett Avenue and Balboa Avenue.

COAST ROUTE IMPROVEMENTS

This improvement to the Coast Route within the city limits of San Diego will do much to aid in the movement of the large volume of traffic using the route from San Diego and the north.

The construction of an important grade separation on the Coast Route will be set in motion with the advertising for bids for the Madrone Crossing subway under the tracks of the Southern Pacific Railroad near Morgan Hill in Santa Clara County. The subway will be located to the southeast of the present grade crossing and the contract will include the construction and paving of the approaches and the construction of the reinforced concrete abutments of the structure itself. The railroad will furnish and place the steel plate girders to carry the tracks over the highway.

Piru Gorge Bridges Constructed With Grades and Curves

(Continued from page 4)

inner side. Piers of this bridge were put down through gravel and boulders and carried a short distance into the shale rock which had been worn down to a smooth surface by the rock and gravel washed down the stream.

At Station 130 the bridge is 360 feet in length, consisting of three 80-foot spans and two 60-foot spans. This structure has a grade of 1.76 per cent and one end of it is on a 1000-foot radius curve. The piers here are 50 to 60 feet high and have a solid web. Piers for the other bridges have a web in the lower section with an arched opening above. The piers are founded on rock.

The bridge at Station 145, the one farthest north, consists of two 80-foot and two 60-foot spans. This bridge has both horizontal and vertical curvature, the former being on a radius of 10,000 feet and the latter on a radius of 1000 feet. The grade ranges from 1.76 per cent to 3.72 per cent. There is a small superelevation of the roadway.

F. W. Panhorst is the acting bridge engineer, California Division of Highways, Sacramento. Victor A. Endersby of the Los Angeles office of the Bridge Department had supervision of construction and R. W. Van Stan is the resident engineer.

A Los Angeles company has the contract for the four Piru Creek bridges at \$154,611. Work was started October 1, 1931, and the time limit expires September 13, 1933. The contractors are now well ahead of their schedule and expect to complete the work by the latter part of June.

The steel is being fabricated in Los Angeles.

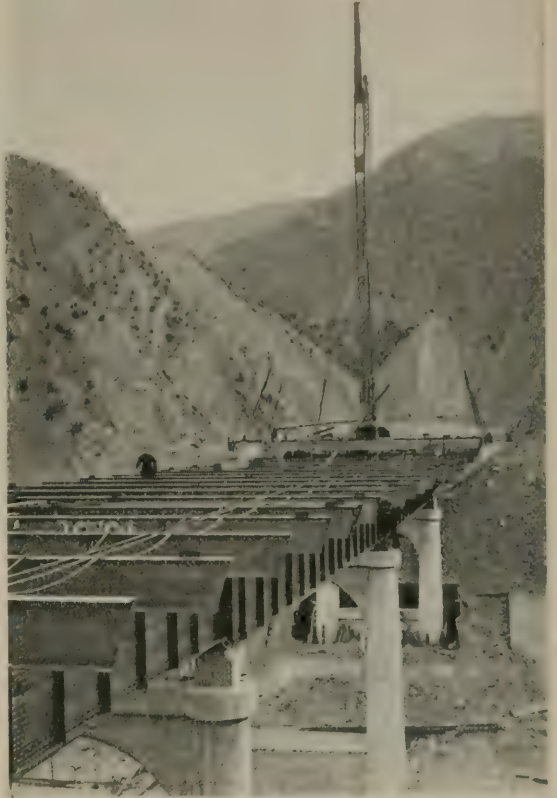
BELIEVE IT OR NOT

Although many freak accident reports come to the Automobile Club of Southern California, none has quite equaled a coincidence occurring at Amersham, England.

When two motorists who had collided at a dangerous corner got out and came face to face, they discovered that they worked in the same office, were both foremen on the same job, and were both responsible for the painting of the white line and danger signs on the road.

"Your name is Kuwatch, is it? Are you, by any chance, the Kuwatch who absconded with \$250,000 and was never caught?"

"Unfortunately, no.—*Fliegende Blatter*.



TRAVELING DAYS are nearly over for the steel floor beams being picked up and laid down by a moving derrick on this Piru Gorge bridge.

Report Compiled on Compaction of Fills

C. S. Pope, Construction Engineer, served on a joint committee, composed of members of the American Road Builders Association and the Highway Research Board of the National Research Council appointed to compile a report on compacting fill material of various types.

The report was submitted at the recent convention of the American Road Builders Association in Detroit. It involved a searching review of literature on the mechanics of earths, as well as a study of State highway specifications of embankments. The report pointed out the wisdom of tests to determine when satisfactory compaction has been reached and made specific recommendation for the prevention of economic loss in this fundamental step in street and highway construction.

Surveys Finished for American Canyon Cut-off, Old Stage Route to Vallejo

By R. E. PIERCE, District Engineer

LOCATION surveys are now practically completed, and it is hoped that work can be started early next summer on the so-called "American Canyon" cut-off, a project that has been under consideration for a long time.



R. E. PIERCE

This is a part of the improvement of the present road from Oakland to Sacramento and will connect up with the newly paved cut-off recently completed between Cordelia and Fairfield. Recent summer traffic counts have indicated a peak count of over 4000 autos a day. It seems reasonable to assume that this will be materially increased with the improvement of this route

and return of normal times.

OLD STAGE ROUTE

This project will save a greater mileage than any other single change now contemplated on this route, and the time saved will be greater than the saving in distance would indicate, due to less congestion and greatly improved alignment.

In early days, the stage road between Vallejo and Sacramento followed the American Canyon, as it was the most direct route. Since the paving of roads from Vallejo to the Sacramento Valley via the Jameson Canyon, practically all through travel has stopped using the American Canyon, as the present road is not much better than a trail through the hills, impassable in wet weather due to the unsurfaced adobe soil through which the road runs for considerable distances.

When the State highway system was originally laid out, the only method of crossing the Carquinez Straits with autos in traveling between the Sacramento Valley and Oakland was by means of the Southern Pacific train ferry between Benicia and Port Costa. This fixed the location of the primary route between Oakland and Sacramento passing

through Benicia and in consequence most of the vehicular traffic used that route between the Capital and Bay region.

The State highway route connecting the Sacramento Valley with Napa and north coast points passed through Jameson Canyon north of the American Canyon with only a county road connection to Vallejo from the "Y" a few miles south of Napa.

When an automobile ferry operating from near Vallejo to the south side of the Carquinez Straits was put into operation, practically all the auto traffic between the bay region and the Sacramento Valley used this route, and with the completion of the Carquinez Toll Bridge a few years ago, still more traffic was attracted to this route.

The American Canyon lying south of the Jameson Canyon and offering the opportunity for large saving in distance and excellent alignment with easy grades has long been considered as the logical routing for this important road.

NO GRADE SEPARATION

Travel using the present route between Cordelia and the Carquinez Bridge must cross five different railroad grade crossings. The new location intersects a railroad only once and here a subway is proposed which will eliminate any crossings at grade.

A comparison of distance and curvature on the present route with those on the proposed relocation follows:

	Present route	American Canyon	Saving
Length -----	17.4	11.4	6.0
Number of curves-----	46	14	32
Minimum radius curves	30'±	2500'	
Total central angles--	859°	293°	566°
Railroad grade crossings -----	5	None	
Maximum grade-----	12%	6%	5

Funds allotted for the next biennium provide only for grading. Unless money not now in sight is provided, the completion of this important road must be deferred until the biennium beginning July 1, 1935, when it is hoped additional funds will be allocated or otherwise made available.



WHERE COVERED WAGONS trundled and express stages dashed at breakneck speed over the old trail between Sacramento and Vallejo, surveyors of the Highway Division have been at work. They have completed location studies for a modern highway on new alignment through American Canyon for the so-called American Canyon cut-off. It will save mileage and time between the Capital and the Bay District. The present unsurfaced dirt road through the scenic canyon is impassable in wet weather.

New 1933 Road Map Just Published by Division of Highways

THE 1933 edition of the California road map has been published by Earl Lee Kelly, Director of the Department of Public Works. This new map has been prepared by the Division of Highways under the direction of C. H. Purcell, State Highway Engineer.

The map conforms to standards adopted by the Western Association of State Highway Officials. These standards for the preparation of State road maps control the size of the map, the colors, style of lettering and legend used, so that road maps published by all States which are members of the association are uniform in character.

PRINTED IN COLORS

The size of the map is 28" x 34", it shows the entire State as a unit and is printed in four colors. The roads shown on the map include the primary and secondary routes of the State Highway System and the principal county roads. Three different widths have been used in delineating the roads according to their classification as Federal aid routes, United States highways, State roads or county roads.

All principal towns and cities are shown and the mileage between points is clearly indicated. The type of surfacing which obtains is shown by colors on both State and county roads.

One of the features of the map which makes it particularly valuable for touring purposes is the notations indicating the United States Highways by number. United States Highways are the main

transcontinental, both east-west and north-south, and principal interstate routes officially numbered by the American Association of State Highway Officials.

CITY AREAS SHOWN

Printed on the reverse side are large scale maps of the chief metropolitan areas in California, showing the principal arterials and through streets. These local maps show areas in the vicinity of Los Angeles, San Francisco Bay, San Diego, San Jose, San Bernardino, Sacramento, Stockton, Fresno and Bakersfield. There is also a small scale map of the 11 western States with the U. S. numbered highways shown thereon.

Copies of this latest California road map may be secured from the Bureau of Publications and Documents, Department of Finance, State Capitol, Sacramento, at a cost of thirty-five cents.

ELECTED CHAIRMAN OF SNOW CONFERENCE EXECUTIVE BOARD

H. M. Stafford and S. M. Munson of the Division of Water Resources attended the first Western Interstate Snow Survey Conference held on the campus of the University of Nevada, Reno, on February 18. They report that the conference was well attended by those interested in snow survey work from Utah, Nevada, and California. Present problems and methods for improving both operative and research work were discussed in sessions from ten in the morning until eleven p.m. Mr. Stafford was elected chairman of the conference executive committee for the next year.

Angelica: "Joe's new speedster is awfully cute."

Betty: "Yes, you ought to see it play dead on a lonely road."

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY-----Director
JOHN W. HOWE-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 11 MARCH, 1933 No. 3

KEEPING FAITH

The good word comes from California that the Highway Commission down there has allowed \$136,000 for construction on the Weed-Klamath highway, beginning at the State line and going south as far as the money will go.

The stretch of road between the State line and Dorris, about four miles, is perhaps the worst piece of road on the whole route. New construction there will be a great improvement to the whole Weed-Klamath road program, and the California appropriation adds strength to the hope that work will be authorized soon on the Oregon side of this important highway.

In the Klamath County budget there is an appropriation for \$20,000 for right of way for the Weed road, to be used if the State and Federal Government see fit to go ahead with construction on the Oregon side this year.

California has repeatedly promised to do its share in the Weed road program. It has already done much in keeping maintenance funds available for the road and in construction work there. The latest report indicates California's determination to keep faith in helping to bring to completion one of the most important highway links on the coast. —*Klamath Herald of Klamath Falls, Ore.*

PERU BUILDING ROADS

A program of highway construction, including roads over some of the world's most rugged country and at great altitudes, has been inaugurated by the government of Peru, according to a report received by the California State Automobile Association. A total of about 3800 miles are to be built, at the rate of 250 miles a year. The cost will be about \$60,000,000.

Judge: "What's the charge against this man, officer?"

Cop: "Arson, Your Honor, burning up the road."

Highway Jobs in 1932 Provided Livelihood For 4,000,000 People

"HIGHWAY construction is the most effective job creator among public works. For that reason Federal aid for roads assumes an importance warranting immediate action by Congress."

This is the view expressed in a statement by C. H. Moorefield, President of the American Association of State Highway Officials, discussing the relation of highway construction programs to the unemployment situation. The statement continues:

"Highway work offers a distribution of labor perhaps unequaled by any other large industry. The United States Bureau of Public Roads learned in a thorough study that ninety cents of the road dollar goes to labor.

State highway programs, aided by Federal appropriations, in 1932 provided employment for more than 333,000 men directly on roads. This figure is taken from contractors' pay rolls. Another 660,000 men were kept busy supplying materials and equipment. With dependents, State road building gave a means of livelihood to at least 4,000,000 people.

Highway building brings to the people the country over something they need and something which does not have to be sold before used. For these reasons, highways have been given first rank as a provider of jobs.

Immediate action should be taken by Congress on Federal aid authorizations for the next two fiscal years, as the current authorization ends July 1. This done, the States can lay plans to proceed with their full 1933 programs and men can resume their jobs. Then the country will have at least one large industry proceeding in its normal course."

MONEY FOR CALIFORNIA

Motorists bound for winter resorts are rolling over midwest highways in greater numbers than last year, according to the Automobile Club of Southern California. It is observed by the club that a possible increase in motor tourists this year would greatly increase new money coming into southern California through expenditures during motoring vacations.

NEW OVERHEAD CROSSING

Plans are complete for a change of line about one mile in length and a new structure over the Southern Pacific tracks at Elwood, on the Coast Highway, about ten miles west of Santa Barbara. This change will eliminate a rather dangerous condition at the approaches to the present overhead structure.

State Honors First Navel Orange Tree

THE first official State marker erected to designate an historical landmark was dedicated at Riverside on February 17th at the site of the parent navel orange tree, the progenitor of the State's greatest industry.

The dedication ceremonies, attended by State, city, county and civic officials signified the inception of a program for suitably marking with standard official location and directional signs places and objects of historic interest and importance. This program is being carried out through the cooperation of the California Highway Commission, the Department of Public Works, the California State Chamber of Commerce, the Department of Natural Resources and the automobile clubs.

GOVERNOR SENDS GREETINGS

DeWitt V. Hutchings, member of the State Chamber of Commerce Committee, and chairman of the day, read a telegram from Governor James Rolph, Jr., expressing his regret in not being able to be present and congratulating the city on its historic connection with the great navel orange industry of California.

The speakers included Ora E. Monette, chairman of the Historical Marker Committee of the State Chamber of Commerce; Lt. Governor Frank F. Merriam; State Highway Commissioners Frank A. Tetley, Riverside, and Timothy A. Reardon of San Francisco; Daniel H. Blood, Director of Natural Resources; A. D. Shamel, U. S. Bureau of Plant Industry and Mayor E. B. Criddle of Riverside.

Mr. Monette, who has taken a very active interest in organizing the historic marker program, in his speech, emphasized the significance of the movement from the standpoint of the sentiment and idealism back of it. He said it was the idea of signing places in which were inherent the elements of history, chronology, growth and progress.

STARTED BY WOMAN

A narration of the facts concerning this parent navel orange tree, prepared by the Riverside Chamber of Commerce, says:

"The navel orange industry of today has back of it a romantic story that dates to a time nearly sixty years ago, when men lost heart and laughed at a woman's efforts to



AN ORANGE SHRINE, the parent navel tree of California, was officially marked for future generations to visit by the erection and dedication at Riverside, February 17, of this first historical landmark sign. The young ladies are just adding pulchritude to the picture.

save and bring to life two scrubby sickly-looking little orange plants. Had it been left to those men the navel industry never would have been known in the southwest, the only spot in the United States to which the navel takes kindly.

"In 1873 Mrs. Eliza C. Tibbets received from a friend of hers two navel orange trees which had been imported from Brazil. These were sent by mail to Mrs. Tibbets at Los Angeles, and Mr. Tibbets made a three-day round trip from Riverside to Los Angeles to get them from the post office. These trees were set out in the garden of the Tibbets home, and Mrs. Tibbets watered and cultivated and nursed them along until they began to put on a healthy growth and

(Continued on page 36)

Desert Trail Becomes a Highway For Transcontinental Tourist Traffic

THE gray-green of mesquite and dusty purple of pungent sage shimmered in the scorching heat of a pitiless desert sun, a chimera, away to the blue mists of barren and gullied mountains.

Following the faint tracks of a vague trail through the dry chaparral, Thomas Blythe came to a muddy river gouging its channel deep into the desert crust. Before his eyes stretched a valley, some ten miles long and five miles wide, along the western bank of the muddy stream. The rich alluvial soil was covered with feed for cattle: Here was water; here was feed; here was a site for a stockman's homestead.

And here was the embryo of that southern California garden spot—the Palo Verde Valley.

Settlement of the Palo Verde Valley dates back to 1856 with the coming of Thomas Blythe to California. About 1877 Samuel Blythe acquired some 40,000 acres of land under the swamp and overflow act. Cattle raising was the chief activity until 1904 when the Palo Verde Land and Water Company purchased the Blythe holdings and commenced extensive irrigation. In 1923 the Palo Verde Irrigation District was formed. The community has steadily developed and of the 89,000 acres within the district, some 33,000 acres of rich alluvial soil are now under water, producing thousands of bales of cotton, and tons of alfalfa, grain and fruits annually.

IN SYSTEM SINCE 1919

Prior to the construction of the California Southern Branch of the Santa Fe through Blythe, the old desert wagon trail leading westward served as a road to Mecca and the Southern Pacific Railroad. With the universal use of motor cars and the advent of modern trucks this old road became an important outlet from the prospering Palo Verde district to the coast. The third State Highway Bond Act of 1919 included the 91 miles between Mecca and Blythe as a unit in the State highway system.

Extending through the vast arid stretches of the eastern half of Riverside County, the State highway known as the Mecca-Blythe lateral, connects the fertile Palo Alto Valley

which lies along the bank of the Colorado River, with the El Centro-San Bernardino highway, and serves as a link of the transcontinental U. S. Route 60 into which feeds another transcontinental route, U. S. 70.

FROM THE ATLANTIC

These transcontinental routes originate on the Atlantic seaboard, No. 60 at Newport News, Virginia and No. 70 at Beaufort, North Carolina. Coming into California via the Ehrenberg Bridge near Blythe, U. S. 60 serves as the shortest route between Phoenix and the southern California coast, being approximately sixty miles shorter than any other route.

In 1928 the Ehrenberg toll bridge was constructed across the Colorado River about four miles east of Blythe, replacing the ferry which had operated for many years as a connecting link between California and Arizona. Under the authority of the Toll Bridge Act of 1929 the Department of Public Works, in 1931, acquired the control of this structure and it became a part of the State road system. The 1931 Legislature, in adopting additional secondary routes, included within the State system the connection between Blythe and the bridge and a connection with the El Centro-San Bernardino road at the westerly end of the lateral.

Subsequent to the inclusion of this road across the desert in the State highway system, the Division of Highways has steadily advanced improvement from Blythe westward until, with the completion of a contract now under way, some 71 miles of this highway from the bridge westerly will have been constructed to the modern standards set for desert highways.

SOLVED DESERT PROBLEM

The placing of a permanent highway across desert lands presents construction problems which are difficult of solution. While rainfall in the deserts of southern California is only 4 or 5 inches annually, it falls in two or three storms of cloudburst proportions, which play havoc with the loose desert sand and gravel.

Road Protected from Flood Waters

(Continued from preceding page)

Water channels shift from one storm to another and a roadbed built without adequate protection is liable to serious damage on many sections.

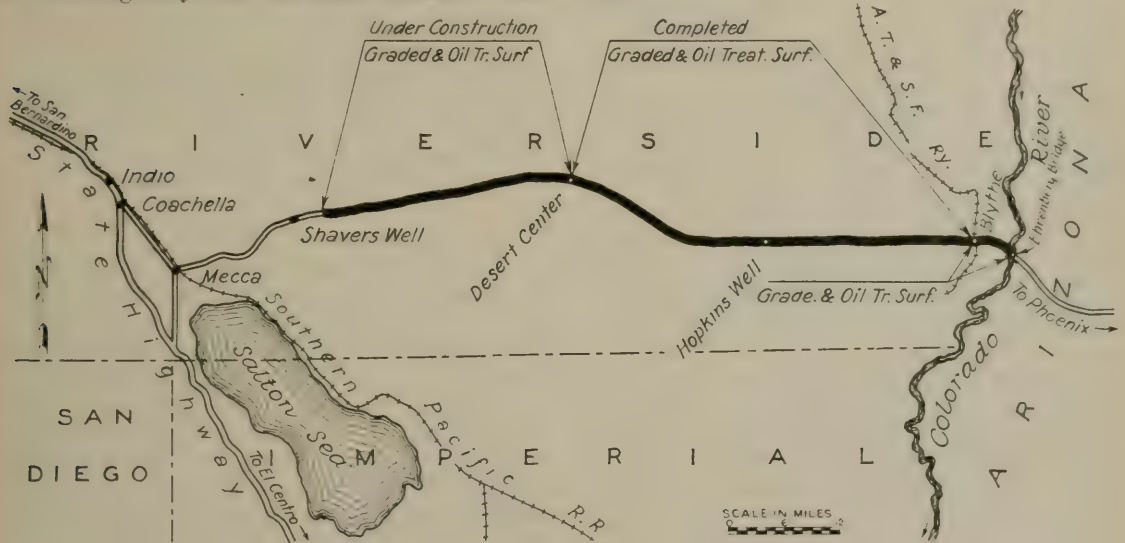
The Division of Highways has developed a means of protection in the construction of desert roads which has proved to be eminently successful in combating the destructive violence of desert storms.

The protective method which has been adopted in both San Bernardino and Riverside counties consists of constructing wide, deep channels and dikes parallel to the line of the highway and at some distance from

gram on the portions not improved, are giving this section of southern California a highway which renders adequate service.

DITCH AND DIKE

The first contract to be awarded by the State for work on this highway, involved the worst section and included the grading of 21 miles between four miles west of Hopkins Well and Desert Center. The second contract called for grading and surfacing the 9.5 miles across the Palo Verde Valley from Blythe to Black Butte. This work was completed in 1926.



the road. These ditches cross the path of flow and direct the water into a lead channel which carries it under a bridge set in the roadbed.

This method of combating the fury of the waters of desert floods has proven so successful on the State's highways that damage to the roadbed has become practically negligible.

In the construction of the Mecca-Blythe lateral the method of ditch and dike protection has been used from Black Butte westerly, where the road crosses the vast desert north of the Chuckawalla Mountains. The program of improvement to this route has included six contracts up to the present time, which, with a comprehensive maintenance pro-

gram on the portions not improved, are giving this section of southern California a highway which renders adequate service. Next came the construction of the highway between Black Butte and 9.5 miles west of Hopkins Well, a distance of 22 miles. It was on this project that the ditch and dike construction was begun as a protection to the roadbed against damage from desert cloud-bursts. The extent of this protective work may be judged from the fact that the construction of the ditches and dikes involved over 300,000 cubic yards of excavation and 17 timber bridges across the main channels which passed through the roadbed. This improvement was made in 1928 and 1929.

The fourth project carried the new road westerly to Desert Center, a distance of 16.2 miles. This stretch of highway was completed in July, 1931, and the construction of

(Continued on page 30)

Highway Bids and Awards for January in Eight Counties

IMPERIAL COUNTY—At Brawley, 0.4 of a mile grading and paving with Portland cement concrete. Dist. VIII, Rt. 26, Sec. H. United Concrete Pipe Corp., Los Angeles, \$26,555; Walter Trepte, San Diego, \$27,988; H. E. Cox & Son, Pasadena, \$26,984; Match Bros., Elsinore, \$26,672. Contract awarded to B. G. Carroll, San Diego, \$20,856.

KERN COUNTY—Between Union Ave. and Minkler Spur, 2.9 miles grading paving realignment with asphalt concrete. Dist. VI, Rt. 4, Sec. G. Peninsula Paving Co., San Francisco, \$145,953; Heafey-Moore Co., Oakland, \$183,619; Fred W. Nighbert, Bakersfield, \$162,355; Hall-Johnson Co., Alhambra, \$165,808; Valley Paving & Const. Co., and John Jurkavich, Fresno, \$157,361; Union Paving Co., San Francisco, \$137,620; Lee Moor Contracting Co., El Paso, Texas, \$175,630; Weymouth Crowell Co., and E. Penn Watson, Jr., Los Angeles, \$160,260; J. F. Shepard, Stockton, \$183,866; A. Teichert & Son, Sacramento, \$158,515; D. McDonald, Sacramento, \$167,380; Von der Hellen & Pierson and Southwest Paving Co., Los Angeles, \$164,847; Basich Brothers, Torrance, \$140,129; Fredrickson & Watson, Oakland, \$147,004. Contract awarded to Gogo & Rados, Los Angeles, \$118,547.

LOS ANGELES COUNTY—In Redondo Beach, 1.4 miles grading and paving with asphalt concrete. Sully-Miller Contract Co., Long Beach, \$51,184; Southwest Paving Co., Los Angeles, \$56,528; Hall-Johnson Co., Alhambra, \$53,260; Gogo & Rados, Los Angeles, \$52,933; J. L. McClain, Los Angeles, \$59,828; Oswald Bros., Los Angeles, \$52,712; Artukovich Bros., Hynes, \$58,379. Contract awarded to Griffith Company, Los Angeles, \$51,705.

ORANGE COUNTY—Between Irvine and Tustin, 5.6 miles grading and paving with Portland cement concrete. Dist. VII, Rt. 2, Sec. C. Southern California Roads Co., Los Angeles, \$99,936; United Concrete Pipe Corp., Los Angeles, \$89,351; Artukovich Bros., Hynes, \$94,059; Gogo and Rados, Los Angeles, \$88,435; Oswald Bros., Los Angeles, \$91,077; J. L. McClain, Los Angeles, \$89,988; Daley Corporation, San Diego, \$90,581. Contract awarded to Griffith Company, Los Angeles, \$85,420.

RIVERSIDE COUNTY—Between Edom and Indio, 11 miles to be graded and paved with asphalt concrete. Dist. VIII, Rt. 26, Sec. E. A. Teichert & Son, Inc., Sacramento, \$203,118; United Concrete Pipe Corp., Los Angeles, \$244,881; Griffith Company, Los Angeles, \$172,819; Basich Brothers, Torrance, \$179,302; Southwest Paving Co., Los Angeles, \$177,562; Gogo & Rados, Los Angeles, \$192,880. Contract awarded to Oswald Bros., Los Angeles, \$171,115.

SAN BERNARDINO COUNTY—Between Vineyard Ave. and Sierra Ave., 10.2 miles to be graded and paved with Portland cement concrete. Dist. VIII, Rt. 26, Sec. D. Basich Bros., Torrance, \$324,672; Match Bros., Weymouth Crowell Co., & Penn Watson, Jr., Los Angeles, \$342,920; Hall-Johnson Co., Alhambra, \$349,165; E. H. Bashaw, Los Angeles, \$338,505; Griffith Co., Los Angeles, \$321,284; Southern California Roads Co., Los Angeles, \$365,331; Sander Pearson, \$333,685. Contract awarded to United Concrete Pipe Corporation, Los Angeles, \$309,386.

SAN JOAQUIN, SOLANO AND YOLO COUNTIES—Applying oil to 108.8 miles roadside vegetation. Dist. X. Rts. 6, 7, 8, 53. Peninsula Paving Co., San Francisco, \$1,872; Basalt Rock Co., Napa, \$2,268; Oilfields Trucking Co., Bakersfield, \$1,980; C. F. Fredrickson & Son, Lower Lake, \$1,980; Lee Immel, Berkeley, \$1,609; Dee Strong, Sacramento, \$1,620; Highway Builders, Ltd., San Anselmo, \$2,007; A. Teichert & Son, Sacramento, \$2,601. Contract awarded to R. M. Sheldon & Son, Suisun, \$1,404.

SANTA CLARA AND SANTA CRUZ COUNTIES—Between Saratoga Gap and Black Road, 6.4 miles to be graded and oiled. Dist. IV, Rt. 55, Sec. A. MacDonald & Kahn, Ltd., & D. McDonald, San Francisco, \$421,232; Granfield, Farrar & Carlin, San Francisco, \$301,559; Merritt-Chapman & Scott, San Pedro, \$355,814; S. J. Graves & Sons, Los Angeles, \$460,882; Clyde W. Wood, Stockton, \$358,649; Von der Hellen & Pierson, Castaic, \$344,065; Guy F. Atkinson Co., San Francisco, \$376,432. Contract awarded to Union Paving Co., San Francisco, \$288,468.

U. S. Road System Will Suffer by Withdrawal of Federal Support

WARNING that withdrawal of Federal aid in road building will immediately prove costly to motorists and taxpayers and will throw the highway system of the nation into such confusion that it will not recover for years, was recently issued by H. P. Gillette, editor of *Roads and Streets*, and a leader in the good roads movement.

"Federal aid created a nation-wide highway system out of the unorganized and unconnected road building efforts of the various States," said Mr. Gillette. "Before the Federal program was initiated in 1916 less than a dozen States had efficient highway departments.

"Routes connecting all parts of the country have been established. Standard types and qualities of roads, varied of course, to fit local conditions, have been adopted. Efficient and economical methods of construction and maintenance have been put in operation.

MOTORISTS PAYING IT

"All this has been done with the Federal government paying only 8 per cent of the cost of road building the country over. Motorists now are returning to the Federal treasury in gasoline taxes and excise taxes on automobiles and equipment, more than the amount of the annual Federal aid appropriation, which in recent years has been \$125,000,000. Recent 'increases' in this appropriation have not added to taxes, being merely advances to be returned to the national government by the States from future normal appropriations.

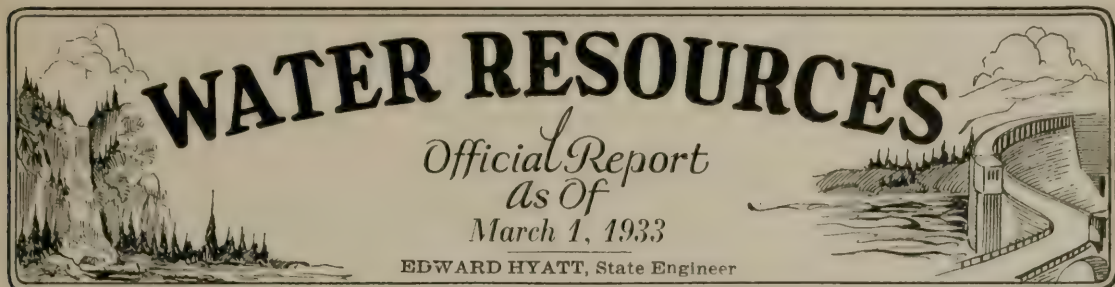
"Far more than the annual Federal appropriation is saved each year through lowered costs of road construction and maintenance brought about by the standards set up by the Federal Road Bureau. This saving extends down to county and township roads."

ARCHITECTURAL AWARDS

for January and February

MENDOCINO STATE HOSPITAL, Talmage. Dairy Units: Contract for general work, to Oliver S. Almlie, Merced, \$44,900; for electrical work, to Eddy Electric Company, Stockton, \$886; for refrigeration work, to Cycoys Iron Works, San Francisco, \$2,898; for plumbing and heating work, to Hateley & Hateley, Sacramento, \$6,066.

CAMARILLO STATE HOSPITAL. Water storage system: Contract awarded to Harry F. Miller, Los Angeles, \$15,287.



A low winter stage for streams in the Sacramento and San Joaquin valleys with a snow pack 50 inches less in depth on the Sacramento watershed summit than last year is disclosed in the report of State Engineer Edward Hyatt covering the activities of the Division of Water Resources for February. Other features of the report include two applications for water released from Hoover Dam to irrigate acreage totaling 1,450,000 acres in Imperial and Coachella valleys; a decrease in depth and water content of snow on the Sierra slopes with an average precipitation below normal in northern stream basins and a general average of 10 per cent above normal for southern areas. The report in detail is as follows:

On account of the appearance of elements detrimental to plant growth in some of the deep wells used for irrigation in the Hollister irrigation district, there appears to be danger of damage to some of the orchards in the district. It is claimed that the only remedy for this condition is the substitution of gravity water for well water, at least until such time as a very considerable rise in the ground water in certain localities can be brought about. There is a small amount of water available for winter irrigation for these lands from the natural flow of local creeks and from the San Benito River, but it is thought that if any permanent benefit is to be had it will be necessary to store winter run-off for summer use. In connection with the feasibility of such storage, and at the request of the farm advisor and others interested, a visit was paid to the district and a number of minor storage sites were investigated with the result that it was recommended that a small site on the lower San Benito River be surveyed and detailed study be made by those interested in the development of gravity water.

DISTRICTS SECURITIES COMMISSION

The California Districts Securities Commission met on February 10. The refunding plans for the West Stanislaus Irrigation District were approved. This district has 5½ per cent bonds outstanding in the principal amount of \$1,165,000. The proposed plan involves the extending of maturities over a longer period and a reduction of interest for the first 10 years.

A modification of the plans heretofore approved by the Commission for the replacement of Cuyamaca flume was approved. This flume is the conduit

through which water from the San Diego River is delivered to the La Mesa, Lemon Grove and Spring Valley irrigation district in San Diego County, and the major portion of it has been in use since 1888. It is now proposed to reconstruct about 12½ miles of the conduit by replacing the same with 36-inch to 48-inch concrete pipe. The irrigation district has reasonable assurance that the R. F. C. will advance funds to finance the work, the estimated cost of which is \$419,000.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Routine maintenance work has continued with regular crew of 12 men, in connection with levees, structures, pumping plants, drains and repairs to equipment. The works are now in satisfactory condition.

At the Sutter yard a new timber pile driver frame is being constructed to take the place of the one worn out in service during the past two years. The road on the east levee of the Sutter By-pass, in Sutter County, has been bladed, in cooperation with the county.

Sacramento Flood Control Project—Bank Protection.

The unit of work to be done by the State in connection with the program for permanent bank protection in cooperation with the California Debris Commission, at Tyndall Mound 12 miles above Knights Landing, was completed on February 16. Approximately 3500 tons of rock were placed on a prepared bank 650 feet long.

Two hundred eighty-seven tons of rock were placed for bank protection repairs on the Sacramento River at Oak Hall Bend, in cooperation with Reclamation District No. 535.

The Commission is preparing to protect approximately 2000 feet of river bank along Reclamation District No. 744 at Portuguese Bend. Quarry rock will be used.

Emergency Flood Protection and Rectification of Rivers.

This Division has set up and equipped a camp for 30 men on the Santa Ynez River 15 miles east of Lompoc. This is an unemployment relief project in cooperation with Santa Barbara County, for the performance of clearing work in the channel of the Santa Ynez River. The camp will be in operation about four months.

Russian River Jetty.

Maintenance work on the jetty at the mouth of the Russian River has continued during this period, with a crew of 11 men working approximately four days per week. Several severe storms occurred during the period and some damage was done to the track and

Irrigation Asked for 1,300,000 Acres

(Continued from page 25)

steel trestle. The funds on hand will permit this work to continue until about March 15.

Weather Conditions.

Up to the present time no serious storms have occurred in the Sacramento and San Joaquin valleys and the streams are now only slightly above the summer stage. A recent storm covered certain parts of the Sacramento River watershed with snow to an unusually low elevation, and for a time added to the prospect of flood, had a warm rain occurred. This snow has largely disappeared and the pack at the summit now has a depth of 82 inches, which is 50 inches below that of the same time last year.

WATER RIGHTS

Supervision of Appropriation of Water.

During January, 16 applications to appropriate water were received; 10 were denied and 11 were approved by the issuance of permit. In the same period, 16 permits were revoked and 8 passed to license.

Included among the applications were two of the largest ever received by the office, one an application by Imperial Irrigation District to appropriate 10,000 cubic feet per second released from Hoover Dam on Colorado River for the irrigation of 1,300,000 acres in the Imperial Irrigation District and adjacent areas, and the other an application by Coachella Valley County Water District to appropriate 2000 cubic feet per second of the waters released from Hoover Dam on the Colorado River for the irrigation of 150,000 acres in that district.

ADJUDICATIONS

Eagle Creek (Modoc County). The report covering the distribution of the waters of Eagle Creek in accordance with the trial schedule of allotments adopted for the 1932 season is being circulated among the interested parties.

South Fork Pit River (Modoc County). The report covering the field work on the investigation of the water supply and use of water on the South Fork Pit River has been completed.

Hat Creek (Shasta County). The stipulation for judgment prepared by the Division is being circulated by counsel among the interested parties.

Deep Creek (Modoc County). The report on the trial distribution of the waters of Deep Creek during the 1932 season has been completed.

Franklin Creek (Modoc County). Report on trial distribution of the waters of Franklin Creek during the 1932 season has been completed.

Pine Creek in Surprise Valley and Cottonwood Creek (Modoc County). Reports on these court reference cases have been commenced.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

During the recent storms the flow of the Sacramento River at Sacramento reached 27,000 second-feet but on February 14 it had receded to 12,000 second-feet. The increased flow to the delta has been instrumental in crowding salinity well down into Suisun Bay as shown by the following tabulation of salinity on February 6, 1933, for some of the upper bay and delta stations. The comparative figures given for the salinity on February 6 in 1932 and 1931 indicate considerably more favorable conditions for 1933 than the similar comparison showed in last month's report prior to the recent storms.

Station	Salinity in parts of chlorine per 100,000 parts of water		
	2/6/33	2/6/32	2/6/31
Point Orient.....	1300	1080	1470
Bullshead.....	280	320	680
Bay Point.....	270	90	465
O. and A. Ferry.....	19	7	66
Collinsville.....	3	4	20
Emmaton.....	1	4	2
Antioch.....	4	7	12
Jersey.....	7	8	4
Central Landing.....	2	2	4
Middle River P. O.....	11	5	15

CALIFORNIA COOPERATIVE SNOW SURVEYS

The monthly surveys at key snow courses throughout the State were completed in the latter part of January and early February and the results were published in the season's first regular bulletin sent out February 11, 1933.

In general, the surveys in the major stream basins of the western Sierra slope indicate depth and water content of the snow in early February averaging from 10 to 50 per cent less than a year ago, with a general average of about 30 per cent less. On the eastern slope, snow courses of Truckee and Carson basins show an average depth and water content 50 per cent less than last year; Mono basin 25 per cent less; and Bishop watershed of Owens basin almost equal to last year. Of seven courses surveyed for which the period of record has permitted and development of normals, four in the south Yuba basin show an average depth and water content amounting to 64 per cent of the entire seasonal normal (up to April 1st) and Blue Lakes on the Mokelumne-Carson divide, Rhinedollar Lake close to the Tuolumne-Mono divide and Sawmill at 10,000 elevation east of the Bishop-Kings-San Joaquin divide show percentages of the entire seasonal normal amounting to 49, 54 and 60 per cent, respectively. Last year at this time the corresponding percentages for Summit on the Yuba-Truckee divide, Blue Lakes and Rhinedollar Lake were 115, 93 and 80 per cent, respectively.

The data from the precipitation stations indicate, in general, that this season's precipitation to Feb-

Precipitation Above Normal in South

(Continued from preceding page)

ruary 1st averages 30 to 40 per cent below normal from the upper Sacramento to the Mokelumne River basin, 10 to 20 per cent below normal from the Stanislaus to the upper San Joaquin River basin, about 20 per cent above normal in the Kings, Kaweah and Kern River basins, and from normal to 20 per cent above, with a general average of 10 per cent above normal in the Los Angeles, San Gabriel and Santa Ana basins. Tahoe-Truckee, Walker and Mono basin stations average about 30, 20 and 40 per cent, respectively, below normal and Owens basin percentages vary from an average of 20 per cent below normal for upper Owens and Bishop drainages to an average of 40 per cent above normal for two stations further south in the basin.

DAMS

Certificates of approval of 568 dams have been issued to date, and six certificates of approval of removal.

To date there have been received 818 applications for approval of dams built prior to August 14, 1929, of which 689 are now under jurisdiction; 109 applications have been received for approval of plans for construction or enlargement; and 382 for approval of plans for repair, alteration or removal.

Fourteen dams are under construction and 120 are under repair or alteration.

Application Filed for Approval for Alteration.

Dam	Owner	County
Littlerock	Littlerock and Palmdale Irrigation Dist.	Los Angeles

Plans for Construction Approved.

Dam	Owner	County
Paragon	Paragon Gravel Mine	Placer

Work on the various large projects in southern California is progressing satisfactorily. Bouquet Canyon, an earthfill dam being built by the city of Los Angeles is nearing completion. El Capitan Dam, owned by the city of San Diego, is showing material progress—the sluicing of hydraulic fill having just started. San Gabriel No. 2, a rockfill structure under construction by the Los Angeles County Flood Control District, is about 40 per cent complete. Pouring of concrete at the Pine Canyon Dam of the city of Pasadena has been temporarily halted pending completion of excavation of the abutments to bedrock.

FEDERAL COOPERATION

Topographic Surveying and Mapping.

Vertical controls were run in connection with the Corona sheets in Riverside and San Bernardino counties and the Healdsburg and Kelseyville sheets in Sonoma, Mendocino and Lake counties and triangulation work was carried on in connection with Bogus and Dorris sheets in Siskiyou County, the Hopland sheet in Mendocino County and the Lakeport, Sebastapol, and Venado sheets in Lake, Sonoma and Colusa counties. Transit work proceeded in connection with

the Cucamonga and San Bernardino sheets in San Bernardino County and topographic mapping in connection with sheets in Kern, Fresno and western Kings counties.

The final lithographed sheets of Angle, Lang and Moon Mountain quadrangles of the U. S. Geological Survey, Topographic Branch, are now available, as are also the advance sheets of the Tustin and Newport Beach quadrangles.

The Angle and Lang quadrangles were surveyed in 1929-30 by the U. S. Geological Survey in cooperation with Los Angeles County and are published on a scale of 1:24,000 with contour intervals of 5 and 25 feet, respectively.

The Moon Mountain quadrangle covers an area spanning the Colorado River with only a small corner in California, the work being done by the U. S. Geological Survey in cooperation with the State of Arizona. This quadrangle is published on a scale of 1:62,500 with a contour interval at 25 feet.

The Tustin and Newport Beach quadrangles cover areas in Orange County and the work was done by the U. S. Geological Survey in cooperation with the State of California. The surveys were made in 1932 and the sheets are published on a scale of 1:31,680.

WATER RESOURCES

Ventura County Investigation.

Intensive surveys were initiated on the dam sites in Piru Creek preparatory to making a report on the conflict between highway and reservoir utilization of part of the streambed. Work continued on the final report on the entire investigation of Ventura County.

Santa Clara Valley Investigation.

Measurements were made on Coyote River below Coyote during the month of January for the purpose of establishing the absorption rate in various sections of the channel. In the office work proceeded in connection with assembling data for publication.

South Coastal Basin Investigation.

A summary report discussing the effect of the rainfall of the winter of 1931-32 on the water supply of the South Coastal Basin was issued by the Division during the present month. The South Coastal Basin is the coastal area of Los Angeles, Riverside, San Bernardino and Orange counties. Rainfall was above normal throughout the area in the winter of 1931-32, and while stream flow was below normal, yet it occurred in such a way that the contribution to usable water supply is believed to be larger than normal. The result was that the continued drop in water levels and underground storage which has occurred in that area for many years past was stayed and there was a considerable replenishment to underground storage. This replenishment was large enough so that at the end of the calendar year of 1932 the water levels in the upper part of the basin near the mountains still stood higher on the average than they were at the end of the irrigation season in 1931.

In some areas a rise was as much as 50 to 75 feet and rises of 10 to 15 feet were frequent. This benefit was felt largely in the upper valleys.

Vital Statistics on Dam Applications and Improvements

APPLICATIONS FILED

Application for approval of plans and specifications for construction or enlargement of dam filed with the State Department of Public Works, Division of Water Resources during the month of February, 1933.

LOS ANGELES COUNTY—Eaton Wash Debris Dam No. 32-20. Los Angeles County Flood Control District, Los Angeles, owner; rolled earth fill, 37½ feet above streambed with a storage capacity of 1040 acre-feet, situated on Eaton Wash tributary to Rio Hondo, located in Rancho Santa Anita. For storage purposes for debris, flood control and conservation use. Estimated cost \$441,376. Fee paid \$2,706.88.

Application for approval of plans and specifications for repair or alteration of dam filed with the State Department of Public Works, Division of Water Resources during the month of February, 1933.

LOS ANGELES COUNTY—Littlerock Dam No. 57. Palmdale & Littlerock Irrigation District, Palmdale & Littlerock, owners; multiple arch dam situated on Littlerock Creek in Sec. 27, T. 5 N., R. 11 W., S. B. B. and M.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources during the month of February, 1933.

PLACER COUNTY—Paragon Dam No. 328. Paragon Gravel Mine, Forest Hill, owner; timber and rock, 30 feet above streambed with a storage capacity of 25 acre-feet, situated on Volcano Canyon tributary to North Fork Middle Fork American River in Sec. 30, T. 14 N., R. 11 E., M. D. B. and M. For debris storage.

TEHAMA COUNTY—Ditch Creek Crib Dam No. 263. Heiser Crusade Placers, San Francisco, owner; log crib-gravel fill; 60 feet above streambed with storage capacity of 12 acre-feet, situated on Ditch Creek tributary to Deer Creek in Sec. 17, T. 26 N., R. 3 E., M. D. B. and M. For storage of debris.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources during the month of February, 1933.

VENTURA COUNTY—Lake Sherwood Dam No. 765. Lake Sherwood Country Club, Hollywood, owner; wall and buttress, situated on Triunfo Creek tributary to Malibu Creek in Sec. 27, T. 1 N., R. 19 W., S. B. B. and M.

LOS ANGELES COUNTY—Littlerock Dam No. 57. Palmdale & Littlerock Irrigation Districts, Palmdale & Littlerock, owners; multiple arch, situated on Littlerock Creek in Sec. 27, T. 5 N., R. 11 W., S. B. B. and M.

TRAFFIC DEATHS DECREASE

Motor vehicle deaths declined 221 or 9 per cent in California during 1932, indicating that drivers are at last beginning to heed the oft-repeated admonition to "drive carefully."

The total number killed in motor mishaps as reported by the California Highway Patrol was 2370 in 1932 as compared with 2591 in 1931.

Another factor was the drop in traffic and in motor vehicle registrations.

We are of the opinion that if some one had sounded an auto horn at the psychological moment, America wouldn't have lost that Olympic high jump.—*Thomas-ton (Ga.) Times.*

State Board Reports Alarming Decrease in Fuel Tax Returns

GASOLINE tax revenues for January showed an alarming decrease over similar revenue in January of 1932, according to a statement issued by the State Board of Equalization.

A loss of 12.4 per cent was reported, with revenue for January of this year totaling but \$2,669,278 compared with a figure of \$3,035,629 in the same month of 1932. The difference between these totals was \$336,351.

"This loss in revenue is most discouraging," the statement asserted. "When figures for the entire year 1932 were compiled a loss of but 3.6 per cent was noted, compared with the 1931 revenue. We had hoped this would indicate a change in the downward trend in the gasoline industry."

ABNORMAL LOSS

"Faced with this abnormally high loss for the first month of 1933, it is obvious that our optimism must be tempered with caution."

Sales of gasoline totaled 90,884,805 gallons in January. The board added 1/99th to sales records for the month to arrive at the production figure as required by law. The tax was calculated on this figure, subject to a 1 per cent shrinkage deduction, making the net tax three cents a gallon.

Just what the returns will show for February will not be known till the last of this month as the companies are not obliged to make their returns until March 15.

DOWNWARD TREND

The chart for last year shows a continuing downward trend of gasoline consumption as reflected by the tax assessments all through January to a low point of \$2,987,000 in the first few days of February. Then followed a sharp rise through February to a high point of \$3,425,000 at the end of the month.

The January chart for this year shows a much sharper decline into the February column with no sign of flattening out for the upswing of the usual spring increase in consumption.

Motor vehicle registration and the juvenile population in schools throughout the country are nearly equal in number, according to the Automobile Club of Southern California. This leads to the conclusion that every driver should exercise care in traveling near schools or playgrounds in order to protect every child from accident.

Redwood Lumber for Yolo Causeway



GREAT WAS THE FALL thereof when this giant redwood was laid low, giving employment to woodsmen and mill workers of Fort Bragg, Mendocino County, engaged in getting out lumber for the Yolo Causeway Project. It is 18 feet in diameter at the stump and by actual ring count was 2512 years old. It will furnish 170,000 board feet of lumber.

WHEN the project of widening the Yolo Causeway was announced last fall and the news went out that redwood was specified for the majority of the piling and superstructure lumber to be used in constructing the additional twenty-foot width for the three-mile trestle there was great rejoicing throughout the Redwood Empire in the northern part of the State where a great lumber industry had been prostrated by the general business depression.

Six million feet of redwood was required for the structural lumber on the causeway and a quarter million feet of fir timber was needed in addition to the redwood. That meant widespread relief to unemployment in a large area of the northern counties where the logging industry was the principal means of livelihood to thousands of workers.

Lumberjacks long idle were sent into the forests and mills long closed or running only

on part time were soon operating on full schedule. Literally thousands of workers in the mills and woods and on the logging railroads have been employed throughout the winter in getting out this large order for materials required on the big project.

The accompanying photograph of one of the great redwood trees that was fallen on January 10 by employees of a lumber company at Fort Bragg in Mendocino County was sent to the Department of Public Works by C. W. Sauer, president of the Fort Bragg Chamber of Commerce. In his letter President Sauer says:

"I call your attention to the number of woodsmen in the picture who actually prepared the bed on to which the tree fell and will say that they are certainly real men put back to work through the inauguration of one of the State projects. The tree is now being sawed into material for the Yolo Causeway."

Relief Camp Work Proves Healthy for Itinerant Workers

IT'S a healthy life working for the State in the unemployment relief camp maintained by the Division of Highways in the Arroyo Seco area of Los Angeles County.

The camp averages an enrollment of 250 men from the Los Angeles area, all single itinerants who work for their board and lodging. A recent check-up made by Superintendent C. C. Rossi shows that over a six weeks period most of the men have gained in weight anywhere from 7 to 31 pounds and only four men lost weight.

The result of the check-up was as follows:

- 1 man gained 31 lbs.
- 1 man gained 27 lbs.
- 3 men gained 19 lbs.
- 3 men gained 18 lbs.
- 150 men gained an average of 7 $\frac{3}{4}$ lbs.
- 12 men gained about 15 lbs.
- 46 men gained about 10 lbs.
- 3 men lost 1 lb.
- 1 man lost 2 lbs.

A potent reason for this gain in avoirdupois in addition to the stimulus of vigorous exercise in the open air is the good food served. A specimen day's menu is as follows:

Breakfast	Dinner	Supper
Oranges	Pea soup	Soup
Farina	Prime rib of beef	Salad
Fried ham	Mashed potatoes	Irish stew with dumplings
Fried potatoes	String beans	String beans
Toast	Bread and butter	Hot biscuits
Coffee	Coffee	Pie Tea

In return for their board and keep the men have done the following work from October 15 to February 25 in preparing the right of way for an extension of the Arroyo Seco highway:

- Cleared 49 acres.
- Built 5 miles of trails.
- Burned 23 acres.
- Moved 1000 yards of roadway excavation.
- Moved 3500 yards of slides.
- Built terraces for erosion control on 6 $\frac{1}{2}$ acres of hill slope.

"The Americans," we are told, "want to get rid of prohibition." A bargain; hardly been used at all.—*Punch* (London).

Rastus Jackson, a thoroughly married darky, was one day approached by a life insurance agent.

"Better let me write you a policy, Rastus," suggested the agent diplomatically.

"No, sah," declared Rastus emphatically. "Ah ain't any too safe at home as it am!"—*Typing Tips*.

DON'T UPSET HIGHWAY SYSTEM, HYDE WARNS

Former Secretary of Agriculture, Arthur M. Hyde, in a recent address to State highway officials, emphasized the danger to property owners inherent in the "uniformed propaganda" directed at upsetting the carefully established and highly successful system now in operation.

Said Secretary Hyde, "Since the financing of State road construction is almost wholly now from taxes paid by the road users through motor fuel and license taxes, plus Federal aid, and the support of the local road systems largely from taxes on property, it is obvious that the expansion of Federal and State highway systems has resulted in the relief of property taxation through the taking over of roads which have hitherto been largely financed from the source of taxes on property."

DESERT TRAIL BECOMES A HIGHWAY

(Continued from page 23)

the dikes and ditches involved the movement of nearly 260,000 cubic yards of material and the construction of 16 bridges.

The most recent contract to be completed on this desert lateral comprises the construction of the most easterly section of the route, the 3.7 miles between Blythe and the Ehrenberg Bridge.

NEW ALIGNMENT

Construction of the 19.5 miles between Desert Center and Shavers Summit is now under way and the completion of this contract is expected about August 1st of this year. Much of the section of the road is on a new alignment which lies to the south of the existing road. The new location skirts along the southerly edge of the Chuckawalla Valley between the proposed location of the Hayfield Reservoir of the Colorado River Aqueduct and the Chuckawalla Mountains.

The excavation for the ditches and dikes on this project is estimated to be nearly 500,000 cubic yards and the plans call for the construction of 46 timber bridges, involving the driving of approximately 3000 piles.

The plan of steady improvement to this route which has been adopted by the Division of Highways is giving to southern California another modern desert highway which will adequately serve in carrying both interstate travel and traffic to and from the fertile Palo Verde Valley, and with the completion of the contract now under way there will remain only the modernizing of the few miles necessary as the connecting link to the El Centro-San Bernardino highway.

Rocky Creek Span on Monterey Coast



A FEW weeks ago several hundred Monterey citizens and highway officials gathered at Bixby Creek to open to traffic and dedicate a wonderful new bridge. The celebration was inspired not only by the completion of the new Bixby Creek Bridge, the longest concrete arch bridge in the West, but also by the fact that the bridge opened to travel many miles of new high speed highway providing easy and comfortable access for the motorists to a long stretch of a hitherto remote section of the Monterey coast.

The more spectacular features of the larger structure have quite eclipsed the shorter but none the less beautiful bridge built in an equally picturesque setting across Rocky Creek one-half mile north of Bixby Creek.

TWO HUNDRED TWENTY-FIVE-FOOT ARCH

Rocky Creek Bridge also crosses high over a narrow rocky canyon which opens directly on the ocean beach, a stone's throw distant. Niches were cut and massive concrete abutments were set deep into the rocky canyon walls to take the reactions of the 225-foot concrete arch ribs which carry the roadway over the canyon 150 feet above the creek.

In addition to the arch span, five approach spans on the south end and one on the north make a total length of bridge of 497 feet. The bridge has the 24-foot roadway width which is standard for this route. Construction involved 2000 cubic yards of excavation, over 2000 cubic yards of concrete, and about 140 tons of reinforcing steel. The concrete was mixed in the plant at the south end of Bixby Creek Bridge, transported by highline bucket across Bixby Creek, thence by truck over the half mile between the two bridges and again by highline to position in the forms at Rocky Creek. The cost of the Rocky Creek Bridge was approximately \$60,000.

FIVE BRIDGES REQUIRED

Rocky Creek Bridge is the fourth to be completed of a series of arch bridges on this new road and is exceeded in length only by Bixby. The Granite and Garrapata arches were completed earlier and were of shorter span and lesser height.

A fifth arch bridge is now being constructed across Wildcat Creek about five and one-half miles south of Carmel. That bridge consists of three short arch spans.

\$40,499,000 Cost of Abolishing Most Dangerous Grade Crossings in State

By **STEWART MITCHELL**, Construction Engineer of Bridges

A REPORT which deals with the grade crossing problem in California has been prepared by the California Railroad Commission and the Division of Highways of the Department of Public Works jointly as required by Assembly Concurrent Resolution No. 23, Chapter 45, Statutes of 1931.

As stated in the report, its main purpose has been "to outline the magnitude of the grade crossing problem in the State and furnish the necessary information so that the Legislature may have before it sufficient data to plan such programs of improvement as to it may seem proper under the circumstances, looking toward a betterment of the situation based upon such expenditures as can be reasonably justified and financed."

In order to classify all grade crossings according to their relative importance as to potential danger and hindrance to safe travel, they were rated by a formula which took into account the volume of traffic on both the railroad and highway, average speed of such traffic, tracks crossed, accident record, and the protection now provided.

HIGH SEPARATION TOTAL

By this formula all grade crossings were grouped into five classes, the most important one being designated as Class I comprising 464 crossings. The outstanding feature of the report is that while the Class I crossings are only 3.83 per cent of the total main and branch line railroad grade crossings in the State, it would cost \$40,499,000 to separate their grades, the resulting annual cost being \$2,770,000.

The report also segregates all crossings according to whether they are over steam or electric railroads, shows the number on the different railroads operating in the State and groups them according to the jurisdiction of the highway on which they occur; viz, city streets, county roads, and State highways.

There are a total of 12,099 grade crossings over main and branch line railroads in the State with 2403 spur track crossings in addition which are not classified in this study for practical reasons. Of the 12,099 grade cross-

ings, 7750 are over steam lines and 4349 over electric lines; 6355 are within the corporate limits of cities and towns, 5515 are on county highways and only 229 are on the State highway system.

STATE COST INCREASING

At the beginning of 1932, there were 580 grade separations in the State, 427 of which represent an expenditure of about \$21,000,000. The other 153 separations were effected by passing under existing bridges and trestles. These separations were financed 55 per cent by the railroads, 20 per cent by cities, 12 per cent by counties and 13 per cent by State funds; but in recent years, the proportion borne by the railroads has decreased to 41 per cent and the cost of separations built by State funds has risen to 26 per cent.

The report covers the various means by which grade crossing hazards may be reduced, which are:

By proper protection such as gates, warning signals, lighting, etc.

By suitable grade separation structures.

By abandoning and closing crossings through relocation of the highway or by diverting traffic to adjacent crossings which are safer.

Practically all grade crossings have the standard crossing sign and about 25 per cent of them have additional protection such as flagmen, gates, or automatic signals. The total installation cost of this protection in the State is \$2,444,859 and the annual maintenance cost is \$657,322.

It would cost nearly \$9,000,000 to provide single automatic signals at main and branch line crossings not now provided with special protection and the annual cost of maintenance would be over \$700,000. Double automatic signals would cost to over \$10,000,000.

ANNUAL BILL \$30,159,000

The cost of separating all crossings which are considered practical of separation without running into unreasonably large costs for property damage and rearrangement of existing facilities in city districts, is given as \$501,424,000. This is for separating 7997

Water Applications and Permits

APPLICATIONS FILED

Applications for permit to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of February, 1932.

SAN JOAQUIN COUNTY—Application 7494. E. E. Hahn, R. 4, Box 153X, Stockton, Cal., for 0.50 c.f.s. from French Camp Slough, tributary to San Joaquin River, to be diverted in Sec. 6, T. 1 S., R. 7 E., M. D. B. and M. For irrigation purposes (30.70 acres). Estimated cost \$1,500.

PLUMAS COUNTY—Application 7495. Carl G. Hankel, Quincy, Cal., for 30 c.f.s. from South Fork of Feather River, tributary to Feather River, to be diverted in Sec. 8, T. 22 N., R. 10 E., M. D. B. and M. For mining purposes. Estimated cost \$1,000.

SAN BERNARDINO COUNTY—Application 7496. Aubrey Wardman, c/o John M. Kemmerer, 1303 N. Greenleaf Ave., Whittier, Cal., for 2 c.f.s. from springs and underground water in Henderson Canyon, tributary to Santa Ana River, to be diverted in Sec. 9, T. 1 N., R. 6 W., S. B. B. and M. For irrigation and domestic purposes (250 acres). Estimated cost \$1,000.

LOS ANGELES COUNTY—Application 7497. Thomas W. and May Kneen, Topanga, Cal., for 5000 gallons per day from spring and water well tributary to Garapito Creek, thence Topanga Canyon, to be diverted in Sec. 7, T. 1 S., R. 16 W., S. B. B. and M. For domestic purposes.

EL DORADO COUNTY—Application 7498. United States, El Dorado National Forest, c/o E. F. Smith, Supervisor, Placerville, Cal., for 1600 gallons per day from unnamed stream tributary to South Fork of American River to be diverted in Sec. 22, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes. Estimated cost \$250.

EL DORADO COUNTY—Application 7499. United States, El Dorado National Forest, c/o E. F. Smith, Supervisor, Placerville, Cal., for 0.0015 c.f.s. or approximately 1000 gallons per day, from unnamed spring tributary to South Fork of American River, to be diverted in Sec. 22, T. 11 N., R. 16 E., M. D. B. and M. For domestic purposes. Estimated cost \$317.20.

EL DORADO COUNTY—Application 7500. C. M. Carter, R. D. Nicol and W. P. Austin, c/o R. D. Nicol, 1733 Jefferson Street, Oakland, Cal., for 100,000 acre-feet per annum from South Fork of American River, tributary to American River, to be diverted in Sec. 21, T. 11 N., R. 9 E., M. D. B. and M. For municipal purposes. Estimated cost \$3,000,000.

EL DORADO COUNTY—Application 7501. B. W. Stone, 161 Ellis Street, San Francisco, Cal., for 500 c.f.s. and 125,000 acre-feet per annum from Rubicon River, Pilot Creek, Gerle Creek, Loon Lake, Buck Island Lake-Rock Bound Lake, Little South Fork Rubicon River, tributary to American River drainage area, to be diverted in Sec. 9, T. 13 N., R. 16 E., Sec. 11, T. 12 N., R. 12 E., Sec. 24, T. 13 N., R. 13 E., Secs. 11, 31, 34, T. 14 N., R. 14 E., Sec. 4, T. 13 N., R. 15 E., Sec. 2, T. 13 N., R. 13 E., M. D. B. and M. For municipal purposes.

HUMBOLDT COUNTY—Application 7502. Geo. E. and Ora E. Parrish, Bishop Pine Lodge, Trinidad, Cal., for 30,000 gallons per day from McNeill Creek, tributary to Pacific Ocean, to be diverted in Sec. 11, T. 8 N., R. 1 W., H. B. and M. For irrigation and domestic purposes (1 acre).

RIVERSIDE COUNTY—Application 7503. M. E. Hopper and C. E. Wilson, c/o C. E. Wilson, 204 Fourth Street, San Bernardino, Cal., for 0.025 c.f.s. from Cottonwood Canyon, tributary to Salton Sea drainage area, to be diverted in Sec. 14, T. 5 S., R. 11 E., S. B. B. and M. For mining and domestic purposes. Estimated cost \$100.

SANTA CRUZ COUNTY—Application 7504. Theodore J. Hoover, Office of the Dean, Stanford University, Cal., for 1/6 c.f.s. from Waddell Creek, tributary to Pacific Ocean, to be diverted in Sec. 35, T. 9 S., R. 4 W., M. D. B. and M. For irrigation purposes (30 acres). Estimated cost \$25,000.

MONO COUNTY—Application 7505. C. L. Brown, 310 W. First Avenue, La Habra, Cal., for 200 gallons per day from small stream tributary to Lake George, thence Mammoth Creek and Owens River, to be diverted in Sec. 17, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes. Estimated cost \$50.

PLACER COUNTY—Application 7506. Tahoe Treasure Mining Co., c/o Murle C. Shreck, Attorney, Capitol National Bank Bldg., Sacramento, Cal., for 2 c.f.s. from unnamed stream tributary to Lake Tahoe, to be diverted in Sec. 13, T. 14 N., R. 16 E., M. D. B. and M. For mining and domestic purposes.

MONO COUNTY—Application 7507. R. E. Wood, 158 E. Eighty-eighth Place, Los Angeles, Cal., for 0.025 c.f.s. from Lake George, tributary to Mammoth Creek and Owens River, to be diverted in Sec. 17, T. 4 S., R. 27 E., M. D. B. and M. For domestic purposes. Estimated cost \$1,000.

MENDOCINO COUNTY—Application 7508. H. O. Cleland, c/o W. P. Thomas, Attorney, Ukiah, Cal., for 2.5 c.f.s. from Eden Creek, tributary to Elk Creek, thence Middle Eel River, to be diverted in Sec. 24, T. 21 N., R. 12 W., M. D. B. and M. For irrigation and domestic purposes (40 acres).

HUMBOLDT COUNTY—Application 7509. Thomas Nelson McDaniel, 2004 Fourth Avenue, Seattle, Wash., for 300 c.f.s. from Willow Creek, tributary to Trinity River, to be diverted in Sec. 11, T. 6 N., R. 4 E., H. B. and M. For mining and domestic purposes. Estimated cost \$300,000.

SAN BENITO COUNTY—Application 7510. Alice Pierce Fischl, 1560 University Avenue, Palo Alto, Cal., for 3 c.f.s. from North Fork Larios Creek, to be diverted in Sec. 36, T. 17 S., R. 11 E., M. D. B. and M. For mining and domestic purposes.

PERMITS ISSUED

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of February, 1933.

SIERRA COUNTY—Permit 4060, Application 7314. Oregon Creek Company of Camptonville, Yuba County, Cal., February 11, 1933, for 50 c.f.s. from Oregon Creek, in Sec. 34, T. 19 N., R. 9 E., M. D. B. and M. For mining purposes.

STANISLAUS COUNTY—Permit 4061, Application 7452. J. M. De Souza, Rt. 3, Box 944, Modesto, Cal., February 16, 1933, for 0.5 c.f.s. from Tuolumne River, in Sec. 12, T. 4 S., R. 7 E., M. D. B. and M. For agricultural purposes on 40 acres of land. Estimated cost \$100.

SANTA BARBARA COUNTY—Permit 4062, Application 7339. Mary Kinevan, Santa Barbara, Cal., February 17, 1933, for .01 c.f.s. from unnamed spring in Sec. 18, T. 5 N., R. 28 W., S. B. B. and M., for domestic purposes. Estimated cost \$600.

SHASTA COUNTY—Permit 4063, Application 7011. Division of Highways, Department of Public Works, Sacramento, Cal., February 20, 1933, for 0.025 c.f.s. from unnamed spring in Sec. 23, T. 32 N., R. 6 W., M. D. B. and M., for domestic and recreational purposes.

SAN BERNARDINO COUNTY—Permit 4064, Application 7428. L. M. Bailey, Vidal, Cal., February 24, 1933, for 1 c.f.s. from underground flow in Dunkirk Wash, in Sec. 24, T. 2 N., R. 23 E., S. B. B. and M., for mining and domestic purposes. Estimated cost \$2,000.

SAN BERNARDINO COUNTY—Permit 4065, Application 7429. L. M. Bailey, Vidal, Cal., February 24, 1933, for 2 c.f.s. from underground flow in Dunkirk Wash, in Sec. 24, T. 2 N., R. 23 E., S. B. B. and M., for industrial and domestic purposes. Estimated cost \$3,000.

SACRAMENTO COUNTY—Permit 4066, Application 7147. Division of Highways, Department of Public Works, Box 1103, Sacramento, Cal., February 25, 1933, for 0.004 c.f.s. from Read Spring, in Sec. 4, T. 6 N., R. 18 W., S. B. B. and M., for industrial and domestic purposes. Estimated cost \$1,500.

(Continued on page 36)

Grade Crossings on State Highways Lead In Accident Totals

(Continued from page 32)

crossings and the annual cost of so doing amounts to \$30,159,000.

Various surveys referred to in the report show that many of the existing crossings could reasonably be closed for want of sufficient public necessity for their continued use, which would justify the expense necessary for their protection or separation.

Accident records of each crossing have been carefully kept by the California Railroad Commission since January, 1926, and the report shows that during the six years succeeding that time, there has been an average of about one accident per crossing but that there were actually 64.7 per cent of the crossings at which no accident occurred. The records show that the grade crossing situation is being constantly improved as is evidenced by a decrease in the number of accidents occurring annually notwithstanding the fact that the total number of accidents occurring on public highways has been steadily increasing.

MORE HIGHWAY FATALITIES

Fatalities occurring at grade crossings are only about 7 per cent of the total highway fatalities. The report gives a large amount of statistics relative to the conditions and locations under which crossing accidents occur and shows that while the number of grade crossings on State highways is relatively small, the average number of accidents and casualties per crossing is considerably higher than is the case on county highways and city streets.

As a final word of caution or advice, the report states as follows:

"In considering the grade separation problem in individual cases or in connection with a comprehensive plan of improvement, the question of the economical justification should be carefully studied. Two important elements in such a study are the elimination of accidents and interference to the free flow of traffic on the highway and railroad.

HIGHWAY LOCATION FACTOR

Where a crossing of highway and railroad falls within the limits of a major highway improvement, which is frequently the case, the study should include not only consideration of a suitable plan of constructing and financ-

High Vehicle Taxes Operating Against Use of the Highways

ERNEST N. SMITH, Executive Vice President of the American Automobile Association recently carried a warning to members of the Ways and Means Committee of the House of Representatives, when he appeared before the committee in opposition to the continuance of the Federal tax on gasoline, beyond the one year period for which it was established.

Federal, State and local taxes collected on motor vehicles and their use in 1932 amounted to one-fourth of their average value, and reached the highest point in highway history, according to Mr. Smith. This record breaking level of motor vehicle taxation, he added, has reached the stage where it is operating against the use of the highways and with diminishing aggregate returns to the States from this source of revenue.

"In 1932, motor vehicle property in the United States paid a tax of \$1,099,293,844 on a total valuation of \$4,505,625,600. This is equivalent to an average per vehicle of \$45.28. It is equal to an annual tax of 24.4 per cent on the average value of the vehicle. This would mean that over its life period of seven years, the average car owner would pay in taxes 170.8 per cent of the average value of his car."

A flea and an elephant walked side by side over a little bridge. Said the flea to the elephant after they had crossed over: "Boy, we sure did shake that thing!"—*The Safe Driver.*

ing a grade separation but also changes in the highways necessary to obtain adequate and direct highway routes leading to such a separation. These related matters when considered together permit of the most practical and economical method of effecting a permanent improvement in the highway with particular reference to a crossing over the railroad.

The construction of grade separations and the attendant highway construction frequently require cooperation on the part of various political subdivisions and always require negotiations with the railroad company and final approval by the California Railroad Commission. Therefore, considerable time must be allowed between the inception of a grade separation project and the actual start of construction work."

Doctors Operate on 'Hangman's Tree' by Bret Harte Cabin

By H. DANA BOWERS, Landscape Engineer

A HALF century or more before Columbus began pleading with the court—pleading before Queen Isabella for the necessary doubloons and sailing ships to discover new lands which he felt sure existed across the sea to the west—there was growing a mighty oak. Standing alone in a little meadow surrounded by pines and cedars, with a small brooklet fed by springs winding an aimless way across its feet, this oak was destined to play a very important part in the lives of men.

For centuries it has struggled for existence against the elements. The battle for survival of the fittest has been waging for over 400 years against the winds, rain and snow, heat and cold, lightning and fire, until the last few years has finally brought defeat, and slowly this forest giant is succumbing to the ravages of time. Disease and decay have destroyed the limbs, making them soft and pithy, an excellent storage place for the woodpecker's winter supply of acorns on which the worms feast, to be later feasted upon in turn.

USED AS GALLOWS

Unfortunately for some, the highway ran directly under a very prominent and sturdy limb, just a little higher from the ground than the combined height of a horse and rider. When gold and horses disappeared from their rightful owners to such an extent that something had to be done about it, this extending limb began to attract considerable attention as to its possibilities, and it was not long before it was put into use as a means of persuading other would-be gold and horse thieves to change their method of living.

As time passed this famous "quick justice" was replaced by more lengthy court procedure for such cases, and the more modern stagecoach began to replace the saddle for means of conveyance.

The bark began to grow over the rope scars on the upper side of the limb, but at the same time began to disappear from the lower side. A stick of dynamite remedied this however, blowing the limb off and reducing the hazard to stagecoach drivers' heads.

BECAME A HAZARD

Thus this mighty forest giant has stood for years, its use to mankind a thing of the past



HANGMAN'S TREE shorn by doctors

and only gazed upon with curiosity and awe by tourists who stand in wonder and listen to tales of "the days of old, the days of gold—."

It became necessary, for the safety of the traveling public, to remove the decayed limbs, as they were falling continually. The State highway tree surgeons have recently removed these hazards, leaving as much of the framework of the tree as possible, to remain as an historical monument to the pioneers.

This will stand for several years before its entire removal will be necessary. The circumference of this giant is 17.4 feet, with its top limb exceeding 50 feet in height.

Close by stands the Bret Harte Cabin, where Chamberlain and Chafee lived, or "Tennessee and His Partner," as Bret Harte called them in his book of that name, which was written there.

TWENTY YEARS AGO

J. B. Woodson, sixth division engineer, will submit to the State Highway Commission his report of a test made of the quality of the concrete base on the new State Highway north of Fresno. He will report that the four-inch base "will stand any reasonable loads."—*Sacramento Bee*.

"Have you a skeleton in your closet?"
"No, it's out in the garage. I forgot to lock the doors last night and somebody took everything except two wheels and the frame."—*National Motorist*.

Motor Vehicle Fees for 1932 Apportioned

The Department of Motor Vehicles announced on January 30th the apportionment of \$5,927,294.77 to the State Department of Public Works and the various counties of California for road building and maintenance purposes.

The apportionment represents the return of the California motorist's money to him in the form of more and better roads as the sum apportioned is the net amount of all motor vehicle license fees collected in 1932 after deductions are made for handling all registration matters and for operation of the California Highway Patrol.

Of the total collected one-half or \$2,963,647.38 goes to the Division of Highways of the Department of Public Works to be expended on the road-building program. The other half goes to the various counties of the State in proportion to motor vehicle registration from each.

The apportionment was made on a basis of a total fee-paid registration for the year of 2,041,824 vehicles including 1,865,333 automobiles, 8,039 solid tired trucks, 98,244 pneumatic tired trucks, 8338 motorcycles, 7118 solid trailers and 54,752 pneumatic trailers.

Fee paid motor vehicle registrations in California during 1932 totaled 2,041,824, a loss over the preceding year of 65,451.

STATE HONORS FIRST NAVAL ORANGE TREE

(Continued from page 21)

developed into magnificent specimens that produced a new variety of orange in this country.

FOUNDED AN INDUSTRY

"The fruit quickly became popular as it was large in size, handsome in appearance, and luscious in flavor. The news spread, the orange growers came, and from these two trees sprang all the early buds that were used in the production of navel oranges in the State.

"Because of the careful attention given these first two trees, there are today in California more than 10,000 navel orange groves, whose income amounts to something over forty million dollars annually.

"In 1903 both parent naval trees were removed from the Tibbets homestead to places in the city, one being planted at the head of Old Magnolia Avenue at Arlington Avenue."

In Memoriam

The executives of the Department of Public Works and Division of Highways as well as his immediate associates in District IV were shocked by the news of the tragic death of Everett M. Stearns, Jr., as the result of an unusual accident while engaged on work with a surveying party in that district on February 18.

Mr. Stearns was employed on a construction survey in Dublin Canyon, in Alameda County. John F. Nelson and Wade Hendricks two other members of the party were working with him. The steel tape they were using came in contact with a power line which apparently had escaped the notice of all members of the party.

Mr. Stearns was instantly killed while both Nelson and Hendricks were rendered unconscious by the terrific electric shock.

Mr. Stearns was a young man of sterling character who had earned the high regard and affection of all his associates and his passing, in his years of early promise, is deeply felt throughout the district and by his many friends outside of the State service. The Division of Highways extends its sincere sympathy to the beloved ones who mourn his loss.

He is survived by his mother and sister, of Weed, California and his brother Raymond, an engineer of District VII.

WATER APPLICATIONS AND PERMITS

(Continued from page 33)

HUMBOLDT COUNTY—Permit 4067, Application 7373. Thomas K. Walker, Weitchpec, Cal., February 23, 1933, for 0.025 c.f.s. from Diamond Creek and 5 Taylor Springs in Sec. 17, T. 10 N., R. 5 E., H. B. and M. For domestic purposes. Estimated cost \$300.

HUMBOLDT COUNTY—Permit 4068, Application 7374. Mrs. Anna Fries Walker, Weitchpec, Cal., February 25, 1933, for 0.5 c.f.s. from Diamond Creek and 5 Taylor Springs, in Sec. 17, T. 10 N., R. 5 E., H. B. and M. For placer mining purposes. Estimated cost \$300.

LAKE COUNTY—Permit 4069, Application 7051. John R. Connolly et al., 326 Ochsner Building, Sacramento, Cal., February 24, 1933, for 0.1 c.f.s. from unnamed spring in Sec. 32, T. 15 N., R. 8 W., M. D. B. and M. For domestic purposes. Estimated cost \$2500.

HUMBOLDT COUNTY—Permit 4070, Application 7234. J. S. Rivers, c/o W. Ernest Dickson, First National Bank Building, Eureka, California, February 27, 1933, for 8.0 c.f.s. from Hennessey and Lake creeks, in Secs. 10 and 3, T. 5 N., R. 6 E., H. B. and M. For mining purposes. Estimated cost \$3000.

EL DORADO COUNTY—Permit 4071, Application 7478. C. T. Oeste, c/o E. O. Anderson, Youngs, Cal., February 27, 1933, for 0.25 c.f.s. from Middle Fork of Cosumnes River, in Sec. 23, T. 9 N., R. 11 E., M. D. B. and M. For irrigation and domestic on 20 acres of golf course. Estimated cost \$2,000.

With more than 20,000,000 passenger automobiles in operation in the United States there is one car to about each six persons.

And here's one culled from a book of "Breaks" by W. A. Scott: "By an unfortunate typographical error we were made to say on Tuesday that Mr. Blank was a member of the defective branch of the police force. This, of course, was intended to read "the detective branch of the police farce."

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

EARL LEE KELLY-----Director

ERIC CULLENWARD-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

H. S. COMLY, District I, Eureka

F. W. HASELWOOD, District II, Redding

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J. H. SKEGGS, District IV, San Francisco

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E. E. WALLACE, District VI, Fresno

S. V. CORTELYOU, District VII, Los Angeles

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H. M. STAFFORD, Sacramento-San Joaquin Water
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MABEL PERRYMAN, Secretary

DIVISION OF ARCHITECTURE

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Division

P. T. POAGE, Assistant Chief

W. K. DANIELS, Administrative Assistant

HEADQUARTERS

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man

C. H. KROMER, Principal Structural Engineer

CARLETON PIERSON, Supervising Specification
Writer

C. E. BERG, Supervising Estimator Building Con-
struction

J. W. DUTTON, Principal Engineer, General Con-
struction

W. H. ROCKINGHAM, Principal Mechanical and
Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

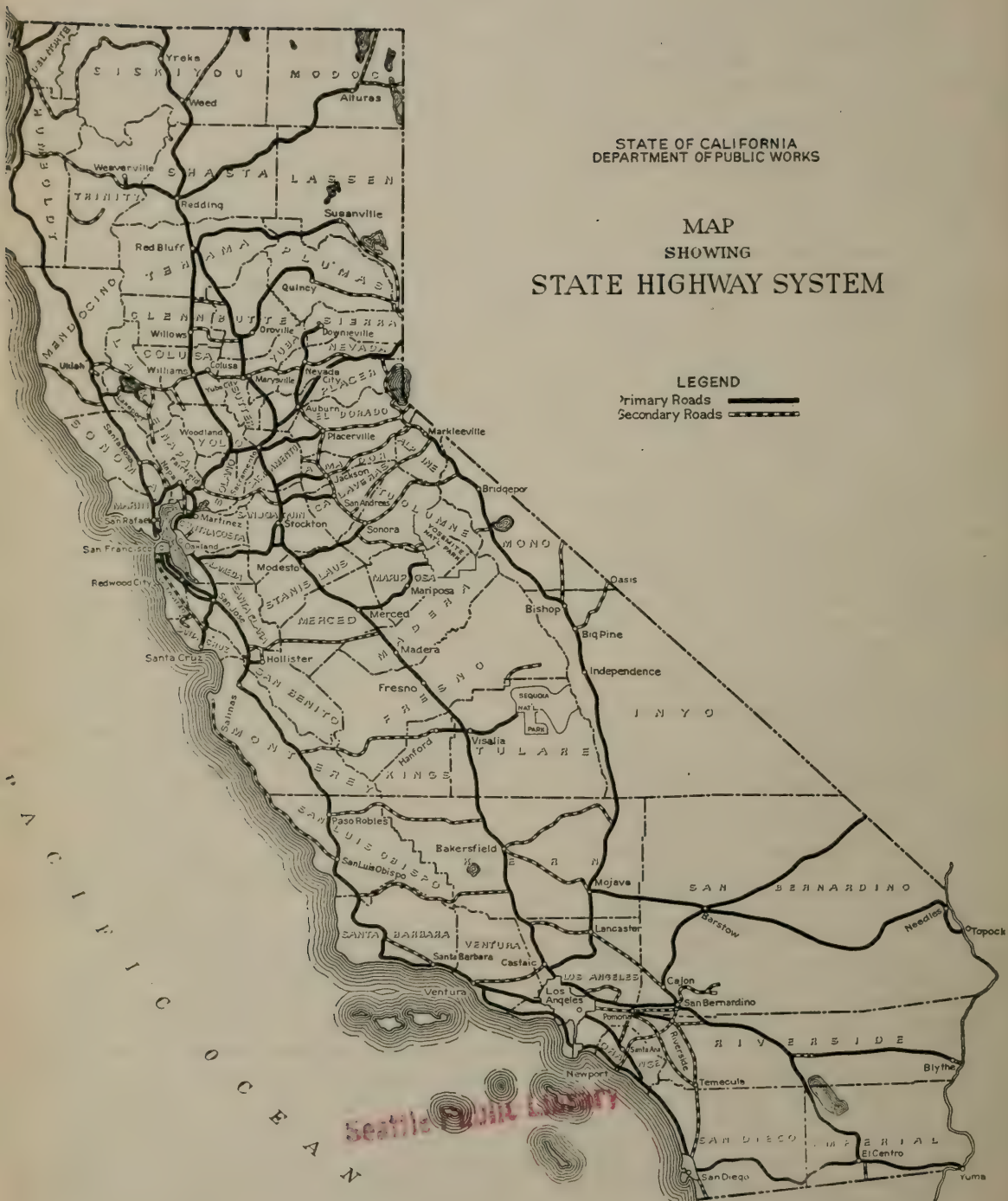
Port of San Diego—Edwin P. Sample

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

LEGEND

Primary Roads —————
Secondary Roads - - - - -



CALIFORNIA HIGHWAYS

 **PUBLIC WORKS**

April 1933



Official Journal of the Department of Public Works
State of California

Seattle Public Library

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6600 Miles of Additional Secondary Roads Recommended to Legislature

Highway Commission and Public Works Report Allots
North 2902 Miles, South 3697. Alternative
Lesser Mileage Totals 2539 Miles

IN compliance with the requirements of Senate Concurrent Resolution No. 7, adopted at the January session of the Legislature, the California Highway Commission and the Department of Public Works submitted a report on March 15th recommending approximately 6600 miles of county roads for addition to the State's secondary highway system, including connections in and through cities, and a similar alternative report of a lesser mileage.

The resolution specifies that the additions shall be made in such a manner as to bring about an equality of secondary mileage between the northern and southern counties.

The two reports with accompanying lists of recommended roads and indexed maps were signed by Director Earl Lee Kelly of the Department of Public Works and Commissioners Harry A. Hopkins, chairman; Philip A. Stanton, Timothy A. Reardon, Frank A. Tetley and Dr. W. W. Barham.

EQUALIZES SECONDARY MILEAGE

The 6600-mile report adds approximately 2743 miles of county roads and 159 miles of city street connections for the north and 3435 miles of county roads with 262 miles of city street connections for the south, providing an equalized secondary mileage of 4844 miles for each section.

The lesser mileage report totals 2539 miles. It provides the same mileage of city street connections as the larger list and gives approximately 713 miles of county roads to the north and 1404 miles to the south, bringing the equalized mileage for both sections to 2813.7.

The following excerpts from the reports present explanatory data on which conclusions and recommendations were based:

* * *

The first principle enunciated in the Legislature's resolution imposes equalization of the

State secondary highway mileage in the north and in the south. The present secondary State highway system includes north 1941.5 miles, south 1146.8 miles, which shows a differential mileage of 794.7 miles in favor of the north. To equalize this difference in adding approximately 6600 miles would require addition in the north approximating 2900 miles and in the south about 3700 miles.

MOST IMPORTANT STEP

The second principle concerns the establishment of a connected and correlated system of State highways extending through municipalities so as to best meet traffic requirements.

The extension into or through municipalities of existing State highways to provide a connected and correlated system is a most important step in meeting traffic requirements.

The studies made by the Division of Highways in connection with this report show that the present State highway system connects with 203 cities. The natural course of these State highways into or through these cities to provide a connected system involves both primary and secondary classes.

MILEAGE IN CITIES

The studies show that 331.5 miles of primary connections and 90.1 of secondary connections should thus be included in the additional mileage for which State funds are to be made available for both maintenance and construction or improvement.

* * *

Considering the inequality of secondary State highway mileage in the north and south sections of the State, the mileage necessary to provide connected and correlated routings through municipalities and the total contemplated additional mileage of 6600 miles to be added to the State system the following tabulation may be presented to show the distribu-

(Continued on page 17)

Quake Damage to Highways Slight; Mostly Confined to Tideland Fills

By S. V. CORTELYOU, District Engineer, District VII

EARTHQUAKE damage to the State highways in the vicinity of Long Beach resulting from the severe shock at about 6 p.m., March 10, and the following minor shocks, was not nearly so extensive as one might expect.

The effects of the quake extended to Santa Monica and beyond, several slides having been started along the coast road northwest of Santa Monica, and the palisades above the Santa Monica "Beach Road" showing numerous new cracks.

Damage to the State highway was largely confined to the portion of Route 60, known as the Roosevelt Highway between Long Beach and Newport Beach. It was particularly heavy in only a few widely scattered sections of a few hundred feet each and each of these sections was where the highway had been constructed over an old tidal slough or estuary.

BRIDGES WITHSTOOD SHOCK

The Hathaway Avenue cut-off from Anaheim Street to Seal Beach received some heavy damage. Wide longitudinal cracks opened up in the shoulders with a few large cracks in the light macadam surfacing. All of the way from Seal Beach to the Santa Ana overflow channel, a short distance southeasterly of Huntington Beach, the concrete pavement, though intact, was left in a more or less roughened condition, although in only a few spots was it badly damaged by settlement of fills in tidal sloughs. Except over these slough areas, the pavement was undamaged. The 10' strips of pavement in a few places were separated by as much as 8 to 10 inches.

Bridge approaches to the Alamitos Bay, San Gabriel and Anaheim bridges settled vertically from 6 to 12 inches, making them practically impassable for the time being. All three of these bridges suffered some damage as well as the pedestrian subway which crosses the highway at Surfside. None of them were weakened to such an extent as to make them dangerous in the least.

The whole surface of the ground within the area affected by the earthquake seems to have

undergone a severe undulating motion which left the pavement slightly rougher than before. Movements on adjoining strips of pavement did not always synchronize with the result that when the tremor was over, a depression would sometimes be left in one strip opposite a summit on the adjacent strip.

REPAIRS QUICKLY MADE

The earthquake occurred on Friday evening, March 10th, and early the next morning maintenance crews from the Orange and Doheny Park districts joined the regular maintenance crew at Seal Beach to quickly make the State Highway entirely safe for traffic, placing barricades wherever necessary to protect traffic and making such temporary repairs as would permit traffic to pass over the highway.

Arrangements were immediately made with owners of the nearest asphalt mixing plant, to start up their plant on Sunday morning, March 12th, and to furnish 500 tons of asphaltic premixed material to fill in the bridge approaches which had settled. On Sunday 294 tons of this material were hauled, an average of ten miles, with the result that by Sunday evening traffic could safely pass over the entire highway.

This work was continued through Monday and Tuesday, an additional 300 tons being hauled on those days. This material was used to lengthen bridge approaches which, although traffic could safely pass over them, were still rather abrupt, and also to equalize places where adjacent pavement strips were left at different elevations. So far there has been used 800 tons of the premix material, and as some further lengthening of bridge approaches is desirable, it is estimated that an additional 400 tons will be required.

SLOUGH FILLS CRACKED

The most spectacular damage to the highway was done on Hathaway Avenue along the east side of Long Beach and also near the Santa Ana River overflow channel, a short distance southeast of Huntington Beach. A portion of the former section which was completed about a year and a half ago, is across

(Continued on page 10)



SHIMMYING TIDAL FLATS doing an earthquake waltz were responsible for most of the damage done to highways in the Long Beach coastal area. No. 1 is a view on Hathaway Avenue the morning after the quake showing how the fill slope cracked badly while the sturdier macadam highway was but little affected. No. 2 shows slab displacement southeast of Huntington Beach near the Santa Ana Overflow Channel. No. 3—Anaheim Bay Bridge showing distortion of the southerly approach by the sinking of a portion of the roadway. This bridge was shortened 9 inches by pressure from the approaches. No. 4—A longitudinal joint opened in highway near the Santa Ana Overflow Channel. No. 5—Alamitos Bay Bridge showing lateral displacement of bridge deck at expansion joint. No. 6—View of displaced cover plate at a transverse joint on the southerly side of Anaheim Bay Bridge.

Savings of Over \$9,000,000 Shown in San Francisco—Oakland Bridge Bids

THE San Francisco-Oakland Bay Bridge, which is the State Department of Public Works' greatest project as well as the biggest job to be started in the United States this year, was advanced nearer to actual construction at the beginning of this month when bids were opened on two more major contracts, and the test suit was filed in the Supreme Court to validate the bridge legislation.

With the six major contracts totaling \$36,841,315.48 almost ready for award, State Director of Public Works Earl Lee Kelly and Chief Engineer C. H. Purcell are planning to go to Washington to request the Reconstruction Finance Corporation to say the word that will let actual construction start.

The low bidders on the six major contracts for the San Francisco-Oakland Bay Bridge, and the amounts of their bids, are:

Contract No. 2—Substructure, West Bay Crossing, The Transbay Construction Company -----	\$6,957,100.68
Contract No. 3—San Francisco Cable Anchorage, Healy-Tibbitts Construction Co.-----	1,036,500.00
Contract No. 4—Substructure, East Bay Crossing, Bridge Builders, Inc.-----	4,495,854.00
Contract No. 5—Yerba Buena Cable Anchorage, Tunnel & Viaduct, Clinton Construction Company of Calif.-----	1,821,292.50
Contract No. 6—Superstructure, West Bay Crossing, Columbia Steel Company--	13,732,471.80
Contract No. 7—Superstructure, East Bay Crossing, Columbia Steel Company--	8,798,096.50

The results of bids received assure the California Toll Bridge Authority that there will be no necessity to request more money from the Reconstruction Finance Corporation, and that the \$62,000,000 estimated for the construction of the bridge proper, which the Reconstruction Finance Corporation has been asked to allow, will be more than ample for this work. Total savings on the six major contracts amount to \$9,768,086.52.

COVER PAGE ILLUSTRATION TELLS STORY IN PERSPECTIVE

The picture of the San Francisco-Oakland Bay Bridge that adorns the front cover page of this issue is carefully drawn with due regard to both artistic and engineering accuracy. It shows a great steel tower supporting the double-decked roadway with the picturesque San Francisco shoreline in the background. To illustrate the traffic capacity Artist Nuese presents a perspective cross-section revealing the six lanes of upper deck traffic and the railroad trains with three truck lanes on the lower deck.

The San Francisco Cable Anchorage will necessitate the construction of a huge block of concrete 108 feet wide, 181 feet long, and 200 feet high, into which the cables supporting the bridge will be anchored with steel eyebars.

CENTER MONOLITH

This block is a substitute for a rock cable anchorage, rock at this site being below the water level—as water exists under the streets of a great part of the San Francisco Bay shore.

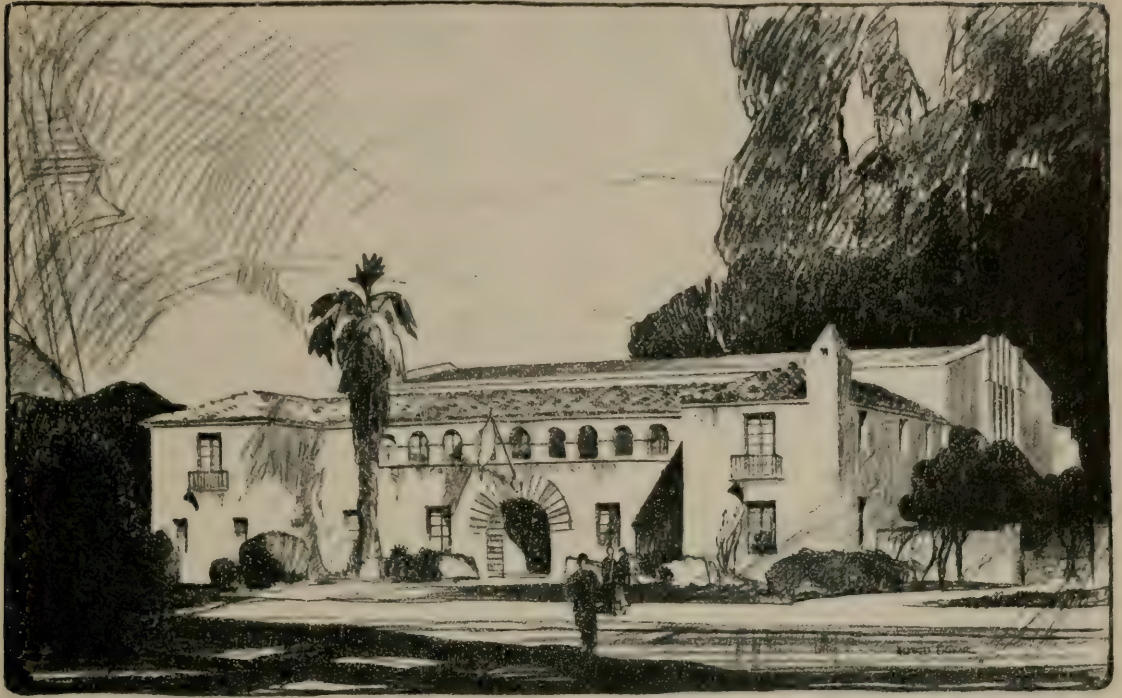
The concrete weight into which the cables will be anchored will contain 68,000 cubic yards of concrete weighing 136,000 tons.

A new world's record will be established on Yerba Buena Island by the double deck vehicular tunnel, which is one sector of the San Francisco-Oakland Bay Bridge. This tunnel will be 76 feet wide, 58 feet high, and 540 feet long, lined with steel—the largest bore in the world. Into this tunnel a six-story building could be placed.

The cable anchorage on Yerba Buena Island will be set into hard rock. Each cable will be anchored in a tunnel comparable in size to the Stockton Street tunnel in San Francisco. Each tunnel will be filled with concrete around the separated strands of the cable, each strand being anchored with steel eyebars.

The west crossing of the San Francisco-Oakland Bay Bridge is similar to the George Washington Bridge across the Hudson River

(Continued on page 15)



MARS WILL REIGN over this beautiful new home for the Second Battalion, California National Guard, soon to be built in San Jose. It will provide companies E and H of the 159th infantry with a 75x100 foot drill hall in addition to office, club, locker and classrooms. Drawing by A. W. Eichler.

By **P. T. POAGE**, Assistant Chief Architect

WITHIN the next few weeks construction will start on the new armory building in San Jose which will be the permanent headquarters of the Second Battalion and the home of Companies E and H of the 159th Infantry, California National Guard.

The 159th Infantry is commanded by Colonel Wayne R. Allen with headquarters at Oakland. Lieutenant Colonel Clarence L. Mitchell is second in command and is the station commander at San Jose. Major Louis J. Van Dalsem is the commander of the Second Battalion.

Company H commanded by Captain Eugene W. Rideout is one of the older units in the State having been originally organized as the Hayward Guard on September 2, 1866. It was reorganized in 1909 and has seen service on the Mexican Border and in the World War. It is now a machine gun company.

Company E is a rifle company commanded by Captain George Barber and was organized on June 20, 1924.

The plans for this building have been prepared by the Division of Architecture of the State Department of Public Works with the

close personal attention of Adjutant General Seth E. Howard. The spirit of the exterior design is drawn from Mediterranean precedent interpreted in the simple manner of the early California architecture.

The new building will be built on a site donated by the city of San Jose on the east side of North Second Street just north of St. James Street. This location is in close proximity to both the business and major residence areas and affords the use of St. James Park and adjacent streets for outdoor drill purposes.

The portion of the building facing on North Second Street will be occupied by company offices and club rooms for officers and enlisted men on the first floor and locker rooms, showers and one classroom on the second floor. The office space and locker rooms are planned to provide space for the possible addition of a third company to the local unit.

LARGE DRILL HALL

Immediately back of the office section is the drill hall with a floor 75 x 100 feet. On the west side of the drill hall is a balcony seating approximately one hundred and thirty per-

(Continued on page 25)

Roadside Beautification Report Sent to Legislature With Recommendations

THE Department of Public Works, has transmitted to Governor Rolph for presentation to the State Legislature a comprehensive report based on a survey of roadside beautification in California prepared by the Division of Highways.

The 1931 session of the Legislature, by Assembly Concurrent Resolution No. 34, directed the Division of Highways and the Division of Parks, with the cooperation of the San Francisco Regional Office of the United States Bureau of Public Roads, to formulate a suitable plan through which they might supply a definite leadership in roadside beautification and the development of small roadside parking and recreational areas and the making accessible to the public of such recreational areas.

COOPERATIVE WORK

The resolution also required that a report be submitted to the 1933 Legislature showing the progress made in carrying out the provisions of the resolution.

This progress report has been published as an attractive illustrated brochure and sets forth the results of an extensive survey of the roadside beautification phase of highway development. While the report was prepared and compiled under the immediate supervision of T. H. Dennis, Maintenance Engineer for the Division of Highways, it embodies the ideas of the Division of Parks and the United States Bureau of Public Roads and bears the approval of both of these agencies.

PLAN OUTLINED

The report reviews roadside beautification, parking areas, lookout points and drinking fountains as developed on the State highway system. It also outlines a limited plan for future beautification and development of recreational areas along the highways.

State highways are classified into commercial and recreational routes and included within the report are thirteen page-size detail maps of different areas of the State showing the types of beautification, such as tree or shrub plantings, existing and proposed roadside parks, lookout points and drinking fountains, on all State highways.

The report contains many half-tone cuts which illustrate and amplify the subject matter in the text dealing with various roadside conditions and types of beautification. The possibilities of recreational development and roadside beautification as a phase of highway construction and maintenance are by no means exhausted in the report but rather does it point the way to methods of future beautification work on existing highways and to the desirability of incorporating the features of aesthetic and recreational development into new highway location.

Accompanying the report are six large zone maps which show in detail the recreational routes of the California State highway system. On these maps, which were made from reductions of large maps composed of many United States Geological Survey quadrangles, the principal points of historic interest, scenic spots and general recreational areas are graphically depicted with appropriate notations.

The survey and the complete progress report which has just been published constitute the first effort of any of the major highway organizations in the United States to compile available information and propose definite plans for highway beautification work.

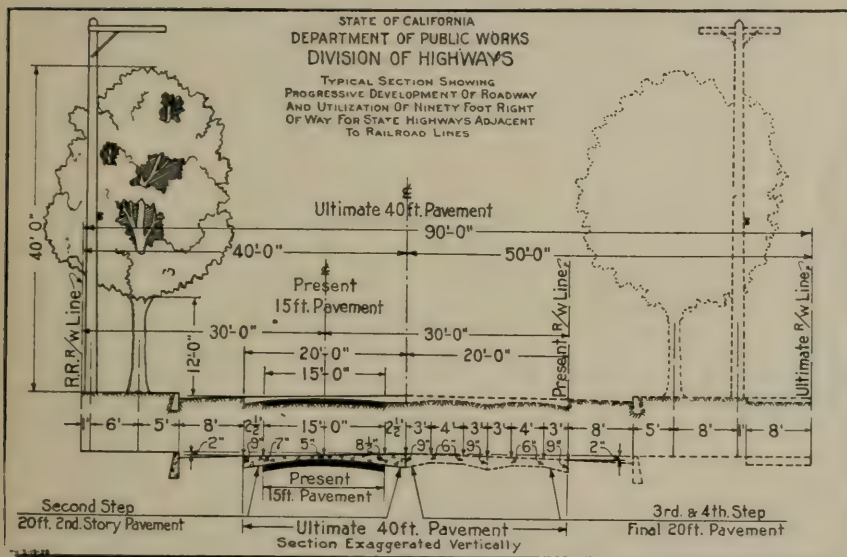
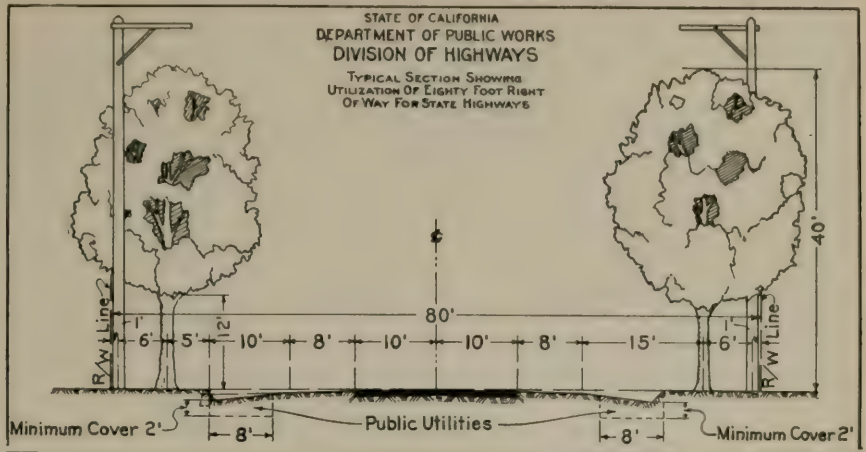
RECOMMENDATIONS MADE

The report makes seven recommendations as the result of the survey. The first three are as follows:

It is evident from studies made by the Division of Highways organization that all available and probable income is required to complete the present highway system within a reasonable period. Diversion of funds in any considerable amount to new projects will delay needed work on roads which would most benefit traffic and might well be questioned at the present time. Future crystallization of public sentiment may justify legislative consideration of such an eventuality.

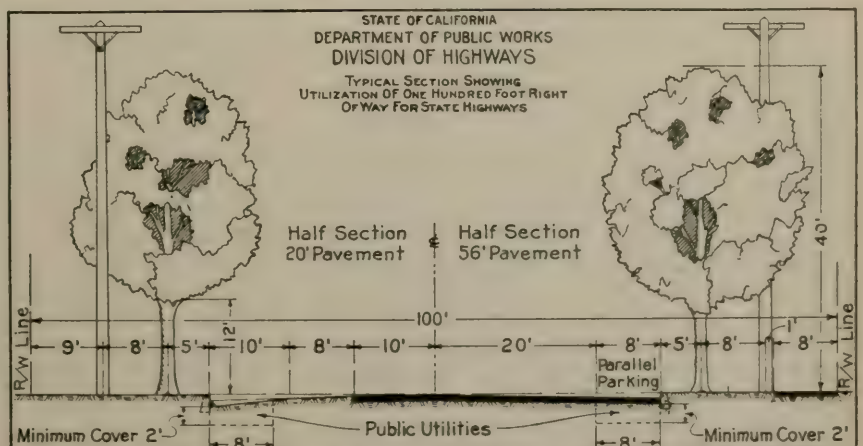
It is recommended, therefore, that no definite year by year program of roadside beautification be set up but that the work outlined in this report be carried out as

Typical section for 80 foot right of way. Standard sections have been adopted and improvements planned to fit in with the ultimate development and tree plantings.



Typical section for 90 foot Right of Way providing for the progressive development of a State Highway adjacent to Railroad lines with an ultimate 40 foot pavement.

Typical section for utilization of 100 foot Right of Way. Permits for Encroachments are controlled to provide least reasonable interference with existing and future plantings.



Safe School Buildings Assured by Rigid State Control of Construction

By **GEORGE B. McDOUGALL**, A. I. A. Chief of Division of Architecture

THE initial earthquake shock that occurred on March 10th last in the southern part of the State was of sufficient intensity to shatter poorly constructed buildings but was successfully resisted by buildings of sound construction. Later shocks caused additional damage.

Similar occurrences with similar results to buildings for similar reasons were experienced at San Francisco in 1906 and at Santa Barbara in 1925. It so happened in each case the catastrophe occurred outside of regular school hours. If it had been otherwise the loss of the lives of school children would have been appalling since in each case numerous school buildings were shattered.

Immediately following the recent disaster a popular demand arose that the construction of future school buildings throughout the State should be controlled by the State itself so as to wholly eliminate the possibility of a repetition of the destruction of such future buildings so far as possible, by securing under known and established principles of sound structural design and construction, the highest practicable resistance to horizontal earth movements due to such earthquakes.

GOVERNOR ACTS

In immediate agreement with this demand and responsive to it, Governor Rolph with legislators from the south, initiated the passage of an appropriate legislative act and on April 10, 1933, after passage in both houses of the Legislature, the Governor approved with his signature an urgency measure that immediately became effective as a statutory law.

This act for the protection of life and property, invests the Division of Architecture of the State Department of Public Works with authority under the police power of the State to prevent the commencement of construction of any new school building or if the estimated cost exceed \$1,000, the reconstruction or alteration of or addition to any school building, until full and complete plans and specifications for such work have been passed upon and approved by the Division of Architecture as to safety of design and construction.

The act also provides that the school boards or other agency for which the particular building work is to be done, shall arrange for competent, adequate and continuous inspection by an inspector satisfactory to the architect or structural engineer and to the Division of Architecture.

POWER TO ENFORCE

The Division furthermore is granted full power and authority to itself make such inspection of construction work as in its judgment may be necessary and proper for the enforcement of the provisions of the act and the protection of the safety of the pupils, the teachers and the public.

Moreover the architect or structural engineer and in cases where a structural engineer is employed by the architect, this structural engineer, also the inspector on the work and the contractor must each make to the Division of Architecture a duly verified report at such intervals of time as prescribed by the Division, showing that of his own personal knowledge the work during the period covered by the report has been performed and materials used and installed in every particular in accordance with the approved plans and specifications. The law makes any person making a false statement in any verified report or affidavit guilty of a felony.

The cost of the service of the Division of Architecture is to be paid by the school district, the amount in each case to be determined on the basis of a percentage of the total cost of the work.

Section No. 8 of the act provides that upon the request of the board of trustees of any school district the Division of Architecture shall make an examination and report on the structural condition of any public school building subject to the payment by the district of the actual expenses incurred by the Division. Provision is made for the waiving of the payment of these expenses in certain cases on the recommendation of the State Superintendent of Public Instruction as provided in the act.

C. H. Kromer, Principal Structural Engineer of the Division of Architecture, will be



FAULTY CONSTRUCTION was responsible for the collapse of some school buildings in the recent earthquake area. A type of construction incapable of resisting horizontal earth movements is illustrated in the above picture. The State has stepped in to prevent the erection of such school buildings in the future by rigid control of design plans, specifications and inspection.

in charge of the administration of the act, reporting to the State Architect.

Immediately following the southern catastrophe Mr. Kromer went to the stricken area remaining there about ten days principally for the purpose of rendering such assistance as he could to the local authorities but at the same time making careful observations of the conditions of various buildings, verifying the statements that destruction of buildings was due principally to poor construction.

During a period of five years, the work still not being entirely completed, under the auspices of the California State Chamber of Commerce at a large expenditure of money together with a very large amount of voluntary expert service by members of the architectural and engineering organizations of the State, a proposed uniform building code has been in process of compilation. Besides the uniform building code executive committee of the State Chamber of Commerce, there have been collaborating in this work the Northern and Southern California Chapter of the American Institute of Architects, the Northern and Southern California Structural Engineers Associations and representatives of the Building Departments of the cities of San Francisco and Los Angeles. Mr. Kromer has represented the Division of Architecture of the State Department of Public Works in this compilation.

While this code is not yet ready to be published as a whole the State Chamber of

Commerce has very kindly consented to the use by the Division of Architecture of such portions of it as apply, in formulating a code in accordance with which future school building work must be done.

Earl Lee Kelly, Director of Public Works, determined at the outset that if available, this uniform building code would be used in determining the character of construction of school buildings under the operation of the new law.

In addition to the code setting up structural requirements, the Division of Architecture will furnish to all applicants for permits to construct school buildings, a set of rules and regulations giving the procedure to be followed in complying with the law.

SAFETY ASSURED

Mr. Kelly has announced that in administering this law it shall be the policy of the Department of Public Works that approval will be given only to such designs, plans and specifications for school buildings and to such continuous competent supervision of construction as will absolutely assure the safety of the children of California who are in attendance in our public school buildings.

The new law vests the Division of Architecture with ample authority under the police power of the State to do this. The Division's approval of plans and specifications will be given only after the most careful check by its structural engineering

“Mudjack” Outfit Effective in Quake Area

(Continued from page 2)

a low tidal flat. Here longitudinal cracks opened up along the shoulders. On account of the unstable foundations, only a temporary macadam surfacing had been placed on this portion, and it showed several wide cracks.

As this type of surfacing lends itself readily to repair by the asphaltic permix material, the cracks were promptly filled leaving no visible evidence of damage to the surfacing. Sandy material was hauled in to fill the cracks in the shoulders, so that this entire section, including bridge approaches, is now in quite good condition.

The other locality just southeast of Huntington Beach where spectacular damage occurred, was a section of concrete pavement a few hundred feet in length, also located over an old estuary. Such violent undulations took place here that when the pavement finally came to rest after the temblor, the outside 10' strip on the landward side at one place was found to be as much as 14" lower than the adjacent strip. This area was immediately protected by barricades and steps were taken to repair the damage.

“MUDJACK” RUSHED FROM CAPITAL

The State highway “mudjacking” outfit made a rush trip from Sacramento, arriving on the ground on Monday evening, March 13th, and started work the following morning. This so-called “mudjacking” equipment has been used for some time on various portions of the State highway system to raise and restore to grade small sections of concrete pavement which have settled for various reasons.

Briefly, this equipment consists of an air compressor with jack hammer, a small mixer and pump and the necessary hose and connections. The air compressor and jack hammer are used to drill holes in the pavement slab to be raised. These holes are about 2½" in diameter and are spaced approximately 5' by 6'. The mixer is then used to mix the “mud” which consists of fine silt to which is added one sack of cement per cubic yard with enough water to bring it to a semifluid consistency.

RAISES PAVEMENT

This “mud” is then pumped under pressure into the holes in the pavement slab,

spreading out under the area to be raised. This equipment operates on the same principal as the hydraulic jack. The pressure exerted by the pump and carried through a hose and hole in the pavement slab, is transmitted to a much larger area where the semifluid material spreads out under the pavement.

This force raises the pavement and as there is sufficient cement in the mud to set, it forms and leaves solid material under the slab which is raised. The pavement is raised from ½" to ¾" at a time, each course of “mud” being allowed to set before the succeeding course is applied. This process is continued until the pavement slab has been raised to the desired elevation.

This method has proved to be so effective that the distortion of the pavement in the locality described above is now hardly noticeable. Although there are no extremely rough places which have not been repaired, it is planned to continue the “mudjacking” work where minor depressions have been left in the pavement all the way from Newport Beach to Long Beach.

SHOCK SHORTENED BRIDGE

The greatest damage to any of the bridges was that done to the Anaheim Bay Bridge near Seal Beach. An examination of this bridge revealed a few outstanding effects, the most notable being, on measuring the over-haul length of the bridge between faces of end paving notches, the bridge was found to be approximately 9" shorter after the earthquake than before. This shortening appears to have come practically all from the shifting of the south end of the bridge toward the north.

The effect has been to entirely close the 3½" and 4" gaps which were left on either end of the steel lift span and to take up some of the slack in the expansion joints on the other span. The movement has cracked the haunches on the outside girders of the east side of the bridge where they rest on cylinder piers. The south set of cylinder piers lean toward the north with a batter of approximately ¼" per foot, and all other bents between this pier and the south end of the bridge lean slightly in the same direction. All bents north of the lift span including the north

(Continued on page 24)

Dust Oiling Program for 1933 Curtailed to About 666 Miles

THE program for dust oiling the rock surfaced and earth roads, while not as extensive this season as for the past two or three years, still represents a considerable amount of work. Plans are completed for oil treatment of some 666 miles of road.

Authority has been issued for the early advertising of ten projects from funds available in the current biennium set-up. The balance of the work must wait on approval of the budget as it is financed from 85th and 86th fiscal year funds. The work is distributed throughout twenty-seven counties. Some of the larger projects included in the program are as follows:

ALONG TRINITY RIVER

On the Redding-Arcata lateral from Weaverville in District II to Blue Lake in District I a total distance of about 95 miles. From Weed to Dorris in Siskiyou County about 59 miles. From Hot Creek to Alturas and the secondary north to Oregon line, all in Modoc County, a distance of about 45 miles.

From McDonald to Booneville in Mendocino County, 20 miles. Mt. Diablo Park roads in Contra Costa County, 19 miles. In Monterey and San Luis Obispo counties, 23 miles.

On the Carson Pass route from Dew Drop Inn to Picketts Junction and Route 23 from Alpine Junction to Hangman's Bridge, about 74 miles. From Laws to Nevada line in Inyo and Mono counties, 38 miles.

In addition a number of shorter sections in various parts of the State will receive treatment. The entire program covers portions of some twenty-six highway routes.

FARMERS WANT BETTER ROADS

The *Bureau Farmer* of the American Farm Bureau Federation says, "There seems ample justification in the continued development of our road building program. * * * The public gets more miles of road for its money than ever before. * * * In no other piece of public work does so much of the invested dollar go to labor as in building roads."

Because of the clamor for drastic reduction of all Federal appropriations, a real fight looms on highway aid. In the meantime less than one-half of the 200,000 miles on our main Federal highway system is surfaced in any way and less than 25 per cent is paved to carry heavy traffic.—*Concrete News*.

Willie (observing leopard at zoo): "Mother, is that the dotted lion the insurance man was telling you about when he loaned his fountain pen to you?"

State to Control all Construction Work on School Buildings

(Continued from page 9)

section has shown that they fully comply with all the requirements involved in the highest possible resistance to horizontal earth movements as provided in the governing code.

The importance of inspection while construction work is in progress can not be overestimated. Before construction work can commence the structural engineer of the Division of Architecture must approve the selection of the inspector to be employed by the school board with the approval of the architect and the structural engineer who has made the structural design of the building, and this approved inspector is to remain continuously on the work during its progress. The structural engineering section of the Division of Architecture will itself make such inspections of this construction work from time to time as in its judgment are necessary in each case to establish assurance that the approved plans and specifications are being accurately followed.

STATE WILL CONTROL

Whenever a school board determines there is doubt as to the stability of an existing public school building under its jurisdiction, to resist horizontal earth movements, the structural engineering section of the Division of Architecture will upon request of such board make examination and report on the condition of such public school building.

It will be apparent that the State itself has now stepped in to positively control school building construction.

As already indicated, experience in previous earthquakes and now in this one in 1933, has revealed the fact that if buildings are designed and built in accordance with known and firmly established principles of sound structural engineering, they are capable of resisting earth movements of the intensities of those which occurred during these three earthquakes and consequently of preventing loss of life and property. This law now effective will secure such construction in all the State's future public school buildings.

"Why does the State of Missouri stand at the head of mule-raising in this country?"

"Because the other end is too dangerous, sir."

Legislature Paves Way for Federal Aid in \$160,000,000 State Water Plan

DURING the past month constructive and forward steps have been taken by both the legislative and executive departments of the State toward the realization of the State Water Plan of California.

With President Roosevelt's announced intention of launching a vast public works program for the relief of unemployment, prompt action was taken by Governor James Rolph, Jr., to place California's initial Great Central Valley project of the State Water Plan within the program of works to be undertaken. Governor Rolph wired President Roosevelt and each one of California's representatives in Congress immediately after the publication of the President's announcement and mailed them full data on the subject.

He also requested Major General Brown, Chief Engineer of the U. S. War Department, who will make the final report on the plan and recommendations to Congress, to arrange for an investigation of the project by his chief assistant engineer, Brigadier General George B. Pillsbury, then inspecting War Department work on the Coast.

LEGISLATURE ACTS

The State Legislature also has been very active. On March 28th the Assembly passed by a decisive vote of 68 to 5, Assembly Constitutional Amendment No. 18, which provides for the enactment of the necessary legislation for the development of the water resources of the State. This proposed constitutional amendment was recommended in both the reports of the California Water Resources Commission and the California Joint Legislative Water Committee.

The amendment was introduced by Assemblymen Chatters, Anglim, Craig, Cloudsley, Cronin, Dempster, Maloney, Ross and Turner. An identical amendment has been introduced in the Senate by Senators Crittenden, Mixter, King, McColl, Allen, Sharkey, Schottky and Waggy. The amendment is now before the Senate for action. It grants specific authority to the Legislature to provide by general law the necessary and proper enactments for the carrying out of a State Water Program. It provides for the loaning of State

credit to public agencies on water development projects, for changes in the law of eminent domain and for the protection of areas of surplus water from being deprived by the State of water required for their ultimate development. The amendment further provides that all projects before construction must be definitely shown to be self-liquidating and that all liabilities incurred must be first voted upon by the people.

PROVIDES BOND ISSUE

One of the most important features of the amendment is that authorizing the Legislature to provide for State water development in conjunction with the United States Government. Companion bills which provide for the issuance of \$160,000,000 State bonds for the construction of the Central Valley project have been introduced also in the Assembly and Senate. The works which would be constructed under the bill include the Kennett Reservoir and power plants, Friant reservoir and power plant, San Joaquin-Kern County Canal, Madera Canal, Contra Costa County Conduit, and San Joaquin River Pumping System and a connecting channel between the Sacramento and San Joaquin rivers. The passage of this legislation would definitely pave the way for Federal financial assistance and participation in the State Water Plan and its consummation.

Pursuant to the request of the Governor, General Pillsbury spent three days making an inspection of the Great Central Valley Project. He was accompanied by the following officials of the U. S. War Department: Colonel Thos. M. Robins, Division Engineer, San Francisco; Captain J. G. Drinkwater, District Engineer, Sacramento; C. I. Grimm, Chief Assistant, San Francisco office, and O. G. Stanley, Chief Assistant, Sacramento office.

MET BY STATE OFFICIALS

The War Department party entered California by automobile from Oregon Sunday morning, March 26th, and was met at the Kennett dam site, near Redding, by Edward Hyatt, State Engineer; Major A. M. Barton, Chief Engineer, State Reclamation Board; Judge Francis Carr, member of Governor



SELLING UNCLE SAM on the merits of California's \$160,000,000 State Water Plan for inclusion in President Roosevelt's public works program for unemployment relief was the motive for a meeting of State and Federal officials in Governor Rolph's office March 27. In the front row, left to right, are Earl Lee Kelly, Director of Public Works; Governor James Rolph, Jr., and Brigadier General George B. Pillsbury, Assistant Chief Engineer, U. S. Army. In rear row, left to right, Colonel T. M. Robins, Division Engineer, U. S. Army; Major A. M. Barton, Chief Engineer, State Reclamation Board; Captain J. G. Drinkwater, District Engineer, U. S. Army, and State Engineer Edward Hyatt.

Rolph's Water Commission, of Redding, and A. D. Edmonston, Deputy State Engineer.

The party inspected the Kennett site in the morning and after lunch in Redding, proceeded to Sacramento by way of the Moulton, Colusa and Sacramento weirs, inspecting the navigation, flood control, reclamation and irrigation possibilities of the river.

Governor Rolph conferred with General Pillsbury and his party at the Capitol on Monday morning. At the conference were Director Earl Lee Kelly, of the Department of Public Works, State Engineer Edward Hyatt, Deputy A. D. Edmonston and Major A. M. Barton.

SUGGESTED LEGISLATION

General Pillsbury stated that if the program for unemployment relief outlined by President Roosevelt is carried out, he saw no reason why the California project should not be considered a very worth while part of that program. He expressed complete satisfaction with the engineering investigation made by the State and was particularly well impressed with the foundations of the Kennett dam site as revealed by the extensive exploratory work. He strongly recom-

mended that California immediately enact the legislation necessary to properly present its case to the Federal authorities.

After conference with the Governor, General Pillsbury continued his inspection tour, going to Merced, Exchequer Dam, and the Friant Dam site on the San Joaquin River near Fresno, in which city the party spent the night.

CANAL ROUTE VIEWED

Tuesday he inspected the area of pronounced water shortage from Fresno to Bakersfield, including Fresno, Tulare, Kings and Kern counties, and looked over the route of the proposed canal designed to relieve that area.

On Wednesday evening, a dinner-meeting was held in Sacramento in honor of General Pillsbury. It was attended by prominent State legislators, State and Federal officials and citizens interested in water matters. Senator Bradford S. Crittenden acted as toastmaster. Governor Rolph, Arthur B. Tarpey and Judge Francis Carr, members of the Governor's Water Commission, Senator Will R. Sharkey and Colonel Robins spoke. General Pillsbury responded. Immediately after the

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Relics Found on Ridge Alternate Prove Ancient Tribe used Asphalt

SOME very interesting relics of an old Indian habitation were recently unearthed in Piru Canyon adjacent to the Ridge Route Alternate Highway, which is under construction in Los Angeles County. The discovery was made while excavating a major channel change in Piru Creek between French Flat and Liebre Creek, about thirteen miles north of Castaic School, the southern end of the project.

Excavation work was done with power shovels, the material being hauled away in trucks. The location proved to be the site of an old Indian village and burying ground. Unfortunately, the power shovels practically demolished the burials so that only fragments were left for inspection.

The Los Angeles Museum was notified of the find and a field party under the direction of Arthur A. Woodward, Curator of History for the Museum, made an inspection of the site and collected such fragmentary relics as they were able to find.

MADE USE OF ASPHALT

Several skeletons were found with what appeared to be a lump of asphalt buried in each grave. Further investigation indicates that these were the remains of old woven baskets which were waterproofed by lining them with asphalt. Apparently these baskets were buried with the owner.

A thin slab of rock was found which had been used as a base for mortars. A stone mortar was found placed in a depression in this slab and was fastened to the base with asphalt. A number of abalone shells were found which had been used for cups and ladles. Small holes in the edges of the shells were filled with asphalt. Numerous beads were uncovered, made from shells and soapstone.

Correlating this find with other Indian relics which have been unearthed both in the mountains and along the coast from San Luis Obispo to Topanga Canyon, just north of Santa Monica, Mr. Woodward was able to describe the division, characteristics and habits of these early inhabitants as well as tell the approximate date this village was occupied.

IDENTIFIED AS CHUMASH

All of the beads which were found had been made from shells and soapstone. None of the Venetian glass beads which were brought into this part of the country by the early Spanish settlers and traded to the Indians were found. It is therefore probable that the village was abandoned prior to 1769, although possibly not many years before that date.

From the characteristics of their burials and relics, these Indians were evidently of the Chumash Division, which once occupied a strip of the coast from fifteen to thirty miles in width from San Luis Obispo as far south as Santa Monica. This village site on the Piru Creek had evidently been selected on account of the water, a few scattering oak trees and the excellent hunting which the country afforded. These people were not agriculturalists but depended on wild game and such wild roots and plants as they were able to find.

Houses were in the shape of half oranges formed by ribs of wood bent to semicircular shape with each end fastened in the ground. The bases were circular with the ribs fastened together at the top. Around this framework hoops of wood were fastened at intervals forming a fairly rigid framework. This frame was then woven with thatch which formed a comparatively comfortable house.

WERE BOAT BUILDERS

The presence of sea shells among the relics indicates that these people were in frequent communication with the coast and it seems probable they spent part of their time in the mountains hunting and part on the coast fishing. They were not a pottery-making people, but used Steatite or soapstone for cooking utensils, dropping heated stones into the vessels of food to heat them. As the Steatite deposit was on Catalina Island, it follows that they had seaworthy boats or canoes, or that they traded with other Indians who were equipped with boats.

The Chumash did make seaworthy canoes of thin plank bound together with leather and wedged with antler and bone wedges. These canoes were waterproofed with asphalt and were used principally for fishing.

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Suits Test Validity of Bay Bridge Bonds

(Continued from page 4)

in that it is anchored on one side in rock and on the other side in a concrete weight.

The east crossing is, of course, a cantilever structure.

The legal hurdles which are being overcome involve the necessary test suits to establish the legality of the Toll Bridge Authority Bonds, which are a first lien against the revenues of the San Francisco-Oakland Bay Bridge, and by the sale of which the San Francisco-Oakland Bay Bridge is to be financed. In order to accomplish the test it was necessary for State Director of Public Works Earl Lee Kelly to refuse, in his capacity as Secretary of the Toll Bridge Authority, to sign the bonds, citing as the basis of his refusal all of the legal points which the Reconstruction Finance Corporation desires court decisions upon.

The suit in the State Supreme Court will particularly test the legality of the construction of the approaches to the bridge from the gas tax fund, as well as the maintenance of the bridge as a part of the State Highway System.

BIDS SHOW SAVINGS

The attorneys for the California Toll Bridge Authority in this case are: Attorney General U. S. Webb; Deputy Attorney General Robert Harrison; Heller, Ehrmann, White & McAuliffe; Thomson, Wood & Hoffman of New York City; Hugh K. McKevitt; C. C. Carleton and J. J. Dailey. Kelly is represented by attorneys F. B. Durkee and C. R. Montgomery of Sacramento.

Bids opened to date showed a great saving over engineering estimates, and indicate that the Chief Engineer's figures are safe and conservative, it was pointed out by State Director of Public Works Kelly at a recent bid opening.

RELICS FOUND ON RIDGE PROVE ANCIENT TRIBE USED ASPHALT

(Continued from page 14)

One of the striking features found in studying relics of these old tribes is the wide use to which they put asphalt. This material was used to fill holes in shells, making them serviceable as utensils for food. It was used for inlaying beads on stone mortars, waterproofing baskets and setting knife blades and arrowheads. In fact, asphalt was used for

In Memoriam

FRANK E. QUAIL, Assistant Maintenance Engineer, Division of Highways, died suddenly on March 10, at his home in Stockton.

For thirty-four years he had been identified with highway work in California, twenty-eight years of that time as County Surveyor for San Joaquin County, and six years with the Division of Highways.

Mr. Quail was born at Upper Sandusky, Ohio, sixty-five years ago. He was educated at Ohio Northern University. On coming to California in 1892 he engaged in general engineering practice for a short time at Stockton and later was with the City Engineer's office at that place for two years. In 1898 he was elected to the position of County Surveyor and was returned for successive terms until 1927. Within that period the road system of San Joaquin County became outstanding among the counties, particularly in the use of oil macadam type of pavement.

Late in 1926 he joined the maintenance organization of the Division of Highways, and was assigned to general field inspection of maintenance work. At that time light asphaltic oil was just coming into general use in dust oiling and preservation of rock surfaced roads, and Mr. Quail's experience proved of great value not only in the development of standardized practice but also in actual instruction of the men engaged on the work.

Mr. Quail was a man of fine habits, even tempered and friendly. His work took him to all parts of the State and his acquaintance with the working organization was wider, perhaps, than that of anyone else in the service. While he reported conditions exactly as he found them he could always be depended on to particularly emphasize good work and to give the extenuating circumstances when he found it necessary to criticize.

In the passing of Frank Quail the State lost a model citizen and the highway organization a faithful friend.

ROADS BUILT WITH WOOL

A road pavement of chemically-treated wool which is said to set as hard as concrete is being tested in New South Wales. Wool of inferior market grade is used.

practically every purpose which required a cementing material. It is evident that these people had access to at least one natural outcropping of this material.

There is evidence that the Chumash Indians traded with Indians who lived far in the interior, even as far as the Colorado River. When one sees the beads which were found in Piru Canyon and realized the infinite amount of work which has been required to grind them to shape, he can only conclude that these were a very industrious people.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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No. 4

ROAD CAMP EFFICIENCY

Butchers, bakers, and candlestick makers to say nothing of scientists, engineers, chefs, carpenters, barbers, tailors, plumbers, electricians, and scores of other skilled artisans are creating an unusual and colorful picture of humanity in kaleidoscopic groups at the State road camps now being used to furnish employment to nonworkers.

Those who have had opportunity to see these little villages along the highways realize how diversified are the talents of those human entities whose similarity ends with the exterior garb of overalls, heavy footwear, and a spade or a pick. The mental caliber, the spiritual plane, the physical condition of each man is as different as day and night, but together they create an efficient group of workers capable of carrying on the entire workings of their roadside villages.

Nourishing meals are prepared by those who are skilled in cooking, clothes are mended by former tailors, the barbers keep the men shaved and sheared, the cobblers take care of the shoe needs, and those not so skilled but physically unfit for the heavy road work are used as dishwashers, bedmen. The remainder, comprising the great majority, is armed with working tools each morning and it is they who add to the vast mileage of good roads which serves to attract thousands of tourists.

This State faces just a little different condition than any other of the forty-eight states of the Union, inasmuch as it is the mecca for thousands of itinerants who seek the golden west when winter fixes its hold in their home states. We can not let these wanderers starve, and yet it is not fair to our own people to feed them, consequently the best we can do is to provide employment with which they may pay board and room.

Forty Billion Dollars Invested in Highways and Motor Vehicles

THE largest "public utility" in America is the highway system and its rolling stock. It represents an investment that is 50 per cent greater than the next largest "public utility," namely, the railways, according to an article in Roads and Streets. The railway investment totals 27 billion dollars as compared with nearly 40 billions in highways, and highway vehicles, the article states. Of this huge sum about 17 billions are invested in roads and streets, and 23 billions in motor-vehicles, garages and filling stations.

"We include filling stations because they correspond with the fuel and water stations on railway lines," says the article. "In this estimate we aimed to secure a total highway industry investment comparable with that shown by the Interstate Commerce Commission as the total investment in railway plants. The latter includes large sums for right of way and terminal lands, but we have made no attempt to estimate the value of rights of way of highways. We have included an estimate of the cost of securing right of way easements.

"This 40 billion dollar highway 'plant' is perhaps the most remarkable development of modern times. During the 15 years ending in 1928 American motor-vehicles increased 19 fold in number. Road improvement lagged woefully behind this increase in rolling stock, for the mileage of 'surfaced roads' only doubled during those 15 years.

"A good many newspaper editors have spoken of so-called extravagance in road building without realizing that road building has lagged far behind the buying of automobiles. We have yet to read a single editorial condemning the public for buying too many automobiles. It would be a singularly foolish public that would invest more than 18 billion dollars in motor-vehicles and coincidentally fail to demand suitable roads over which to drive them.

"Including the new 1 ct. per gallon federal tax on gasoline, motor-vehicle owners would pay \$700,000,000 annually in gasoline taxes, based on the 1931 consumption. To this add \$350,000,000 in motor-vehicle license fees, and the annual 'toll' for the use of the highways becomes \$1,050,000,000. The annual cost of maintaining and repairing the roads is \$450,000,000, leaving \$600,000,000 as income, or 5 per cent on the 12 billion dollars invested in roads."

Roads in State Total 77,000 Miles

(Continued from page 1)

tion of the proposed additional mileage to arrive at an equality:

	North	South
Present secondary system	1941.5	1146.8
To be added (approximately 6600 miles)		
Routes within and through cities connecting present system:		
Primary connections	138.9	192.6
Secondary connections	20.3	69.8
Additional roads, including their connections into and through cities	2743.3	3434.8
Total additions	2902.5	3697.2
Total equalized mileage	4844.0	4844.0

The foregoing tabulation shows that in the contemplation of adding 6600 miles to the State highway system and at the same time equalizing mileage north and south, 2743.3 miles should be included in the north section of the State and 3434.8 miles in the south. * * *

RELIEF FOR COUNTIES

In the preparation of this report, consideration has been given to such county roads which are now carrying or will serve a considerable volume of county or intercounty traffic, and which are connected with the present State highway system. Consideration is also given to the important question of offering substantial relief to the counties, which necessarily includes a State-wide distribution of such additional routes so that all parts of the State may realize such relief and benefit. * * *

In the lesser mileage report the following tabulation shows the distribution of the proposed additional mileage to arrive at an equality on the basis of including 2539 miles:

	North	South
Present secondary system	1941.5	1146.8
To be added (approximately 2539 miles)		
Routes within and through cities connecting present system:		
Primary connections	138.9	192.6
Secondary connections	20.3	69.8
Additional roads, including their connections into and through cities	713.0	1404.5
Total additions	872.2	1666.9
Total equalized mileage	2813.7	2813.7

The large mileage of roads proposed for inclusion and the short time available for such study preclude the possibility of entering into a detailed investigation or the accumulation of such detailed data as have been prepared in reports previously made to the 1931 session of the Legislature and in the report of July, 1932, to this session of the Legislature. It was only because of the thorough and widespread study made by the Division of Highways in the preparation of these earlier reports that sufficient data and information is at hand

to make possible the presentation of a report and recommendation, including a mileage of such magnitude and conforming to the requirements and principles set forth in the legislative resolution. * * *

RELIEF FOR CITIES

The inclusion of routes connecting the present State highway system into and through cities will result in a connected and correlated system, provide better service for traffic and afford material relief to such municipalities in the maintenance of such routes.

It is inescapable that, in the centers of heavier population and adjacent to the larger cities, a larger mileage of roads is to be found. Roads so located carry much the larger volume of traffic as compared to those in far-outlying territory and are, consequently, a greater burden on the county to maintain to a standard which will adequately serve such traffic. Their removal to State jurisdiction will, therefore, offer a substantial measure of relief to such counties. At the same time, the taking over of the more important roads in counties of smaller population with lesser mileage of roads will also afford relief to these counties.

RECREATIONAL AREAS

Maintenance and improvement on such roads is more expensive than on minor roads in order to provide the proper measure of service to traffic. The inclusion of these roads in the State highway system also means that the property owner is protected against assessment for the improving or construction of the road in the future.

Access to the recreational areas, as represented by national and State parks, has also been given attention in the selection of these roads. Roads affording access to such localities have been included in both the north and south sections of the State. This class of road, however, should be limited to some extent in favor of more important commercial, intercounty and intercity highways.

The total public road mileage in the State is estimated to be approximately 77,000 miles; of this total 7350 are included in the State highway system, leaving approximately 69,500 miles which are county roads. Considering this total, the mileage proposed for inclusion may appear to be only a small part; but to draw the conclusion that it would afford an equally small measure of relief is erroneous.

TWENTY-TWO THOUSAND MILES SURFACED

Of this 69,500 miles of county road, about 47,500 are unsurfaced and unimproved roads. The large majority of this latter group carry very little traffic and require small maintenance or improvement expenditure. The remaining 22,000 miles are surfaced and improved in various ways, ranging all the way from gravel through waterbound macadam, bituminous macadam, to Portland cement concrete.

This smaller mileage, approximately 22,000 miles which have been surfaced, is the mileage which is probably requiring the larger expenditure on the part

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Highway Bids and Awards for March

ALAMEDA, SANTA CLARA AND MERCED COUNTIES—Oiling roadside vegetation, about 45.0 miles. District IV, Routes 5 and 32. Peninsula Paving Co., San Francisco, \$1,320; U. B. Lee, San Leandro, \$2,520; Dee Strong, Sacramento, \$1,152; Lee J. Immel, Berkeley, \$1,092; Pacific Truck Service, Inc., San Jose, \$1,350; Oilfields Trucking Co., Bakersfield, \$1,386. Contract awarded to Palo Alto Road Materials Co., Ltd., Palo Alto, \$1,008.

INYO COUNTY—Between Bishop and Round Valley Road, 7 miles to be graded and surfaced with bituminous treatment. District IX, Route 23, Section E. Hemstreet & Bell, Marysville, \$63,288; Southwest Paving Co., Los Angeles, \$65,070; C. O. Sparks, Los Angeles, \$68,653; Fred W. Nighbert, Bakersfield, \$70,596; Weymouth Crowell Co. & E. Penn Watson, Jr., Los Angeles, \$63,052. Contract awarded to Basich Bros., Torrance, \$54,193.

LAKE COUNTY—28 miles east of Mendocino County line, an existing timber bridge to be removed and a reinforced concrete slab bridge to be constructed across Morrison Creek. District III, Route 15, Section B. Alfred H. Voigt Co., Inc., San Francisco, \$13,860; Fred J. Maurer & Sons, Eureka, \$10,900; Sam Sciamino, San Jose, \$8,500; A. F. Anderson, Sacramento, \$10,304; W. E. Lyons, Oakland, \$11,744; Smith Bros., Eureka, \$9,551; F. J. Main, Fairfax, \$13,591; M. B. McGowan, Inc., San Francisco, \$8,878; H. Sneed, Berkeley, \$10,356; E. T. Lesure, Oakland, \$9,196; Whited & Whited, Santa Rosa, \$7,900. Contract awarded to Thos. J. Doyle, San Francisco, \$7,757.

LAKE COUNTY—Between Manila Ranch and Bartlett Springs Road, about 3.2 miles to be graded and surfaced with crusher run base and bituminous treated crushed gravel or stone. District III, Route 15, Section B. Hein Bros., and Basalt Rock Co., Petaluma, \$62,931; Artukovich Bros., Hynes, \$78,186; D. M. McDonald, Sacramento, \$89,505; E. B. Bishop, Sacramento, \$63,340; Willard, Biasotti & Lovotti, Stockton, \$79,207; A. Teichert & Son, Inc., Sacramento, \$64,929; Heafey-Moore Co., Oakland, \$83,507; von der Hellen & Pierson, Castaic, \$79,995; Fredrickson & Watson, Oakland, \$64,877; A. J. Raisch Co., San Francisco, \$60,723; Hemstreet & Bell, Marysville, \$63,561; Granfield, Farrar & Carlin, San Francisco, \$61,246. Contract awarded to Hanrahan Co., San Francisco, \$59,959.

LOS ANGELES COUNTY—Reinforced concrete girder bridge across San Gabriel River 2 miles east of El Monte. District VII, Route 26, Section E. Bodenhamer Construction Co., Oakland, \$124,473; Dimmitt and Taylor, Los Angeles, \$133,010; Oberg Bros., Los Angeles, \$119,144; Frederickson & Watson Const. Co., and Frederickson Bros., Oakland, \$128,898; M. B. McGowan, Inc., San Francisco, \$127,639; Herbert M. Baruch Corporation, Ltd., and Robinson-Roberts Co., Los Angeles, \$128,465; Weymouth Crowell Co., Los Angeles, \$118,634; Merritt-Chapman & Scott Corporation, San Pedro, \$126,114; Lynch-Cannon Engineering Co., Los Angeles, \$138,837. Contract awarded to Clinton Construction Company of California, Los Angeles, \$109,101.

LOS ANGELES, ORANGE, SAN DIEGO AND IMPERIAL COUNTIES—Oiling roadside vegetation, approximately 79.4 miles. District VII. Consumers Oil Co., Los Angeles, \$2,974; Gilmore Oil Co., Ltd., Los Angeles, \$3,655; Bankosky & Oelke, Anaheim, \$4,086. Contract awarded to Square Oil Co., Los Angeles, \$2,752.

MENDOCINO, SONOMA, MARIN, SOLANO AND NAPA COUNTIES—Oiling roadside vegetation, approximately 135 miles. District IV. Lee J. Immel, Berkeley, \$3,401; Peninsula Paving Co., San Francisco, \$3,726; Highway Builders, Ltd., San Anselmo, \$3,842; Oilfields Trucking Co., Bakersfield, \$3,780; R. M. Sheldon & Son, Suisun, \$3,672. Contract awarded to Basalt Rock Co. and Chas. Kuppinger, Napa, \$3,384.

MONTEREY, SAN LUIS OBISPO AND SANTA BARBARA COUNTIES—Oiling roadside vegetation, about 120 roadside miles. District V, Routes 2, 10, 57 and 80. Oilfields Trucking Co., Bakersfield, \$3,315; Western Motor Transfer, Inc., Santa Barbara, \$3,255; Peninsula Paving Co., San Francisco, \$3,450; Walter B. Roselip, San Luis Obispo, \$3,112. Contract awarded to L. A. Brisco, Arroyo Grande, \$2,850.

SACRAMENTO COUNTY—Between Mills and Nimbus, 4.5 miles to be graded and paved with asphalt concrete. District III, Route 11, Section B. A. Teichert & Son, Sacramento, \$112,848; Heafey-Moore Co. and J. A. Casson, Oakland, \$95,320; Frederickson & Watson, Oakland, \$105,474; Peninsula Paving Co., San Francisco, \$99,555; Basich Brothers, Torrance, \$102,141; Hanrahan Co., San Francisco, \$107,270. Contract awarded to D. M. McDonald, Sacramento, \$90,675.

SAN DIEGO COUNTY—Deck plate girder bridge with concrete deck across San Diego River in San Diego, consisting of 8-80' spans on concrete piers and abutments with pile foundations. District VII, Route 2, Section E. M. H. Golden, San Diego, \$109,562; Merritt-Chapman & Scott Corporation, San Pedro, \$125,650; Dimmitt and Taylor, Los Angeles, \$115,787; Bodenhamer Construction Co., Oakland, \$104,941; M. B. McGowan, Inc., San Francisco, \$109,574; Lynch-Cannon Engineering Co., Los Angeles, \$116,545; Weymouth Crowell Co., Los Angeles, \$112,977; W. E. Kier Construction Co., San Diego, \$117,192; Frank Doran, San Diego, \$103,721; Walter Trepte, San Diego, \$109,820; Oberg Bros., Los Angeles, \$120,808. Contract awarded to E. O. Larsen, San Diego, \$99,683.

SAN DIEGO COUNTY—Between Barnett Avenue and Balboa Avenue, about 4.4 miles to be graded. District VII, Route 2, Section E. J. L. Conner and K. Kristich, San Juan Capistrano, \$99,962; Walter Trepte, San Diego, \$113,093; Hall-Johnson Co., Alhambra, \$110,476; S. J. Groves & Sons Co., Los Angeles, \$127,586; V. R. Dennis Construction Co., San Diego, \$116,794; von der Hellen & Pierson, Castaic, \$151,051; Weymouth Crowell Co. & E. Penn Watson, Jr., Los Angeles, \$101,568; Basich Bros., Torrance, \$105,676; Guy F. Atkinson Co., San Francisco, \$116,826; Merritt-Chapman & Scott Corporation, San Pedro, \$99,749. Contract awarded to Daley Corporation, San Diego, \$89,040.

SAN MATEO COUNTY—Between San Francisco and South San Francisco, 3.3 miles grading and paving with Portland cement concrete. District IV, Route 68, Section A. Peninsula Paving Co., San Francisco, \$184,788; Eaton & Smith, San Francisco, \$203,153; The Fay Improvement Co., San Francisco, \$221,674; Fredrickson & Watson, Oakland, \$176,513; Hanrahan Co., San Francisco, \$169,710; N. M. Ball, Berkeley, \$176,432. Contract awarded to Basich Brothers, Torrance, \$166,161.

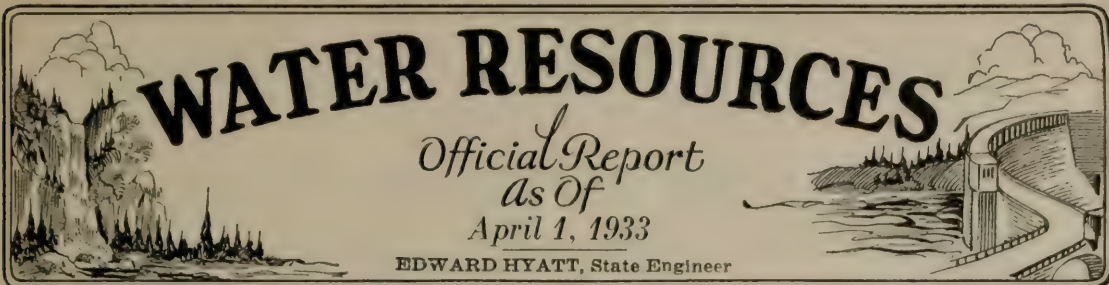
SHASTA COUNTY—Between Jenny Creek and Redding, 1.1 miles surfacing with crusher run base and bituminous treated crushed gravel or stone. E. B. Bishop, Sacramento, \$12,428; Hemstreet & Bell, Marysville, \$12,515; Peninsula Paving Co., \$13,493; Highway Builders, Ltd., San Anselmo, \$9,326; J. P. Brennan, Redding, \$1,191. Contract awarded to Tiffany, McReynolds & Tiffany, San Jose, \$9,163.

SISKIYOU COUNTY—Between Dorris and Oregon State line, about 3.9 miles to be graded and surfaced with untreated crushed gravel or stone and bituminous surface treatment. District II, Route 72, Section C. A. Teichert & Son, Inc., Sacramento, \$114,670; Granfield, Farrar & Carlin, San Francisco, \$117,440; Hemstreet & Bell, Marysville, \$193,210; Dunn & Baker and Johnson Bros. Co., Klamath Falls, Oregon, \$119,666; Heafey-Moore Co., and J. A. Casson, Oakland, \$152,480. Contract awarded to J. F. Shepherd, Stockton, \$85,909.

STANISLAUS, SAN JOAQUIN, CALAVERAS, SACRAMENTO AND AMADOR COUNTIES—Oiling roadside vegetation, approximately 110.7 miles. District X. Lee J. Immel, Berkeley, \$14,664; R. M. Sheldon & Son, Suisun, \$1,380. Contract awarded to Dee Strong, Sacramento, \$1,364.

TUOLUMNE, CALAVERAS, AMADOR, STANISLAUS COUNTIES—Oiling roadside vegetation, approximately 161 miles. District X. Contract awarded to Dee Strong, Sacramento, \$1,692.

VENTURA AND LOS ANGELES COUNTIES—About 110.2 miles of roadside vegetation to be oiled. District VII. Western Motor Transfer, Inc., Santa Barbara, \$4,123; Paulsen & March, Inc., Los Angeles, \$4,208; Gilmore Oil Company, Ltd., Los Angeles, \$4,208. Contract awarded to Square Oil Company, Inc., Los Angeles, \$3,549.



WATER RESOURCES

*Official Report
As Of
April 1, 1933*

EDWARD HYATT, State Engineer

There is little prospect of flood conditions this year in the streams of the Sacramento and San Joaquin valleys unless some unexpectedly heavy storms occur. The snow pack in the mountains is a great deal less than normal with a snow of small water content. In general, snow surveys indicated depth and water content in early March averaging from 40 to 60 per cent less than at that time a year ago with a general average of 40 per cent less for the major stream basins of the Western Sierra slope. Precipitation averages were below normal throughout the State up to March 1.

Mining activities continue to make largest demands for the use of water. News of the irrigation districts with details of dam investigations, reclamation and flood control projects are given in the monthly report of State Engineer Edward Hyatt as follows:

IRRIGATION DISTRICTS

Office work consisted in analyzing and checking annual irrigation district reports forwarded to the State Engineer pursuant to Section 54½ of the Irrigation District Act and in responding to requests for information relating to irrigation matters. The Irrigation Districts Association of California met in Sacramento on March 9, 10 and 11, devoting most of the time of the session to the discussion of legislation affecting irrigation districts. A. B. Tarpey, president of the Fresno irrigation district board, was elected president of the Districts Association, vice Wm. Durbrow, who had served the association continuously for ten years in that capacity, but declined to be a candidate for the ensuing term.

California Districts Securities Commission.

The following irrigation districts have declared that sufficient bonds have been pledged for exchange to make their refunding plans effective:

Grenada district, Siskiyou County: Principal amount of refunding bonds \$136,000; type serial, regular interest rate 6 per cent; interest rate to be adjusted until 1939 to amount the lands can pay, not exceeding the regular rate.

Nevada district, Nevada County: Principal amount of refunding bonds \$8,100,000; type sinking fund, regular interest rate 4 per cent.

Oakdale district, Stanislaus County: Principal amount of refunding bonds \$2,300,000 in four divi-

sions; first division \$200,000 serial, regular rate of interest 5 per cent; second division \$960,000 serial, regular rate of interest 4 per cent; third division \$200,000 sinking fund, regular rate of interest 6 per cent; fourth division \$960,000 sinking fund, regular rate of interest 5 per cent.

At an election held on March 8, the West Stanislaus irrigation district, Stanislaus County, voted a refunding bond issue of \$1,160,000, which represents the bonds of the district in the principal amount now outstanding.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period only routine maintenance work with our regular crew has been performed in connection with levees, structures, pumping plants, drains and repairs to equipment. The crew has continued to work only part time, as it is thought inadvisable to commence any major item of work during the period when storms may be expected. There has been no requirement for ordinary winter activities on account of the lack of storms and flood flows. These activities usually consist of levee patrolling, clearing structures of debris, and performing emergency protection as required.

Sacramento Flood Control Project—Bank Protection.

The California Debris Commission has under way or has completed all of the items of the permanent bank protection program, with the exception of the length of 500 feet at Ministerial Bend in District No. 1500 and the work at Tyndall Mound, which was performed by this office. We have submitted to the District Engineer a tentative list of the items recommended to be included in the 1933-34 fiscal year program for bank protection, a total length of approximately 13,000 feet. The units selected comprise the places most in need of protection. The list as submitted will probably be extensively revised before it is approved by the California Debris Commission.

Emergency Flood Protection and Rectification of Rivers.

The camp set up near Lompoc by this Division, in connection with an unemployment relief project in cooperation with Santa Barbara County, has continued to operate under the direction of this office with a crew of 26 men. This camp is taking care of only single, unemployed men, residents of Santa Barbara County. Timber and brush are being cleared from the channel of the Santa Ynez River.

Russian River Jetty.

The funds available for maintenance on the jetty at the mouth of the Russian River are practically

(Continued on page 20)

Mining Gets Largest Water Permit

(Continued from page 19)

exhausted, and it is expected the work will be completely discontinued within one week. In the past two weeks only sufficient work has been done to repair current damage, which was occasioned by a series of fairly heavy storms.

Weather Conditions.

At this time there is little prospect of flood conditions occurring in the streams of the Sacramento and San Joaquin valleys. Storms are not expected in the immediate future, the low snow in the mountains has practically disappeared, and the main snow pack is a great deal less than normal with a snow of small water content. Rains occurring during the past week have raised the rivers slightly, but a flood condition does not exist in any of the streams. The Sacramento River has risen to a point where a small amount of water is discharging over Tisdale weir, but none of the other weirs of the system are operating.

WATER RIGHTS

Supervision of Appropriation of Water.

Seventeen applications to appropriate water were received during the month of February; three were denied and twelve were approved. During the same period eight permits were revoked and eighteen passed to license.

Mining continues to be the leading activity as reflected by applications received and acted upon, as has been the case for some months, the largest application received being that by Thomas Nelson McDaniel, 2004 Fourth Avenue, Seattle Washington, proposing an appropriation of 300 second feet from Willow Creek, a tributary of Trinity River, in Humboldt County, at an estimated cost of \$300,000 for mining purposes, and the largest permit issued being that to the Oregon Creek Company of Camptonville, California, allowing the appropriation of 50 second feet from Oregon Creek in Sierra County for mining purposes.

Since October 1st of last year, 1102 progress reports have been filed by permittees and 352 reports of use by licensees. Analysis of these reports has been completed and the various permits and licenses have been forwarded for appropriate action, as the circumstances dictated.

ADJUDICATIONS

Whitewater River (San Bernardino and Riverside Counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

Eagle Creek (Modoc County). A stipulation for judgment has been prepared for presentation to the interested parties at a meeting at Eagleville on March 22, 1933.

South Fork Pit River (Modoc County). The report covering the field work on the investigation of

the water supply and use of water on the South Fork Pit River is being circulated among the interested parties.

Hat Creek (Shasta County). The stipulation for judgment prepared by the division is being circulated by counsel among the interested parties.

Deep Creek (Modoc County). A stipulation for judgment has been prepared for presentation to the interested parties at a meeting at Cedarville on March 23, 1933.

Franklin Creek (Modoc County). A stipulation for judgment has been prepared for presentation to the interested parties at a meeting at Davis Creek on March 21, 1933.

Pine Creek in Surprise Valley and Cottonwood Creek (Modoc County). Reports on water supply and use of water on these streams have been completed and are being circulated among the interested parties.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Office work under this project during the past month has comprised the computations and compilations in preparing the 1932 report covering the stream flow, diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory. Field work has included routine maintenance of tide gages and permanent salinity stations in the Delta and Upper Bays.

The flow of the Sacramento River at Sacramento is now 18,000 second-feet and the San Joaquin River near Vernalis about 4000 second-feet, making the combined flow of the two rivers to the Delta 22,000 second-feet. This is a small increase over the flow at the middle of February but during the past month there have been no storms of any magnitude to cause a rise in the rivers. Salinity has been forced well down into Suisun Bay but there has been no benefit, as in some seasons near the beginning of the irrigation season, of a sufficient peak river flow to flush the salinity as far down as the lower part of San Pablo Bay. The following table gives the comparative salinity at Upper Bay and Delta stations on March 6th in the 1931, 1932 and 1933 seasons:

Station	Salinity in parts of chlorine per 100,000 parts of water		
	3/6/33	3/6/32	3/6/31
Point Orient	1180	1320	1460
Bullshead	620	240	640
Bay Point.....	34	70	260
O and A Ferry.....	13	4	72
Collinsville	7	3	4
Enmaton	2	1	1
Antioch	7	3	6
Jersey	6	5	4
Central Landing.....	2	2	4
Middle River P. O.....	5	5	9

CALIFORNIA COOPERATIVE SNOW SURVEYS

The regular monthly surveys at key snow courses throughout the State were completed in the latter

Precipitation Averages Below Normal

(Continued from preceding page)

part of February and early March and all results of these surveys together with all available data to March 1st from the precipitation stations in the foothill and mountainous regions of various stream basins were published in the bulletin sent out March 10, 1933.

In general, the snow surveys indicated depth and water content of the snow in early March averaging from 40 to 60 per cent less than at that time a year ago, with a general average of about 45 per cent less for the major stream basins of the Western Sierra Slope. Two marked exceptions were the Mount Shasta and Mount Lassen courses where the snow was respectively equal to and only 17 per cent less than last year in early March.

Of the few courses where the period of record of the surveys has been of sufficient length to permit the development of normals, four in the South Yuba basin showed an average depth and water content amounting to 68 per cent of the entire seasonal normal (up to April 1st) and Blue Lakes on the Mokelumne-Carson divide, Rhinedollar Lake close to the Tiolumne-Mono divide and Mammoth Pass on the San Joaquin-Owens divide showed percentages of the entire seasonal normal amounting to 56, 57 and 52 per cent, respectively. Last year in early March the corresponding percentages for these three crest courses were 112, 117 and 117, respectively, and for the four South Yuba courses, 122 per cent.

The data from the precipitation stations indicated in general, that this season's precipitation to March 1st averaged 45 to 55 per cent below normal from the Upper Sacramento to the Mokelumne River basin, 30 to 35 per cent below normal from the Stanislaus to Upper San Joaquin River basin, 5 to 15 per cent below normal in the Kings, Kaweah and Kern river basins, and about 20 per cent below normal as a general average in the Los Angeles, San Gabriel and Santa Ana basins. Tahoe-Truckee and Walker basin stations averaged about 40 per cent below normal, Mono basin 50 per cent below and Owens basin percentages varied from an average of 40 and 30 per cent below normal, respectively, for upper Owens and Bishop drainages to an average of 10 per cent below normal for three stations further south in the basin.

DAMS

Certificates of approval of 574 dams have been issued to date and 6 certificates of approval of removal.

To date there have been received 818 applications for approval of dams built prior to August 14, 1929, of which 689 are now under jurisdiction; 111 applications have been received for approval of plans for construction or enlargement; and 383 for approval of plans for repair, alteration or removal.

Twenty-five dams are under construction and 110 are under repair or alteration.

Applications Received for Approval of Alterations

Owner	County
City of Santa Barbara	Santa Barbara
Dam	
Shelf	

Applications Received for Approval of Plans and Specification for Construction

Owner	County
O. R. Smith	Shasta
Dam	Los Angeles
Heart Lake	L. A. Co. Flood Control District
Eaton Wash	

Heart Lake, proposed to be built by O. R. Smith of Red Bluff, is to be an earth dam 38 feet high storing 1000 acre-feet. It will be located on North Fork of Digger Creek, tributary to Butte Creek in Shasta County, and will be used for irrigation and domestic purposes.

Eaton Wash, proposed by the Los Angeles County Flood Control District, will be located on Eaton Wash, tributary to Rio Hondo in Los Angeles County. It will be a rolled earth dam 37½ feet in height with a storage capacity of 1040 acre-feet. It will be used for flood and debris control and conservation.

Plans Approved for Construction

Dam	Owner	County
Ditch Creek Crib	Heiser Crusade Placers	Tehama

Plans Approved for Alteration

Dam	Owner	County
Littlerock	Littlerock & Palmdale Irrig. Dist.	Los Angeles

FEDERAL COOPERATION—TOPOGRAPHIC MAPPING

Horizontal and vertical control work was carried on under the cooperative program between the U. S. Geological Survey and the Division of Water Resources during the month in Orange, Riverside, San Bernardino, Sonoma, Napa and Lake counties.

Topographic mapping was carried on in Riverside, Kings, Kern and Fresno counties, the surveys of No. 39 and Treadwell quadrangles being completed in Kings and Kern counties.

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties). The work of compiling the data collected during the three years investigation and the analysis thereof, particularly in regard to the engineering and economic phases of plans for water conservation by the construction of several projected storage reservoirs, is rapidly coming to a conclusion. The final report will issue at an early date.

Salinas Valley Investigation. Work on a final report on the Salinas Valley investigation is now in progress.

South Coastal Basin Investigation. Report on the quality of water is now in press. Work on capacity of underground basins has been continued and report on the hydrographic data accumulated between January 1, 1932, and January 1, 1933, is in progress. Work on other phases of the investigation has continued in a routine manner.

(Continued on page 23)

Water Applications and Permits

APPLICATIONS FILED

Applications for permit to appropriate water filed with the Department of Public Works, Division of Water Resources, during the month of March, 1933.

SIERRA COUNTY—Application 7511. Alfred T. Burch, c/o R. F. Taylor, Downieville, Cal., for 25 c.f.s. from Middle Fork of North Fork of Yuba River, tributary to Yuba River, to be diverted in Sec. 13, T. 20 N., R. 10 E., M. D. B. and M. For mining purposes. Estimated cost \$10,000.

DEL NORTE COUNTY—Application 7512. A. D. Rutherford and Kathryn Rutherford, Crescent City, Cal., for 0.037 c.f.s. from springs tributary to Smith River watershed, to be diverted in Sec. 20, T. 17 N., R. 2 E., H. B. and M. For irrigation purposes. Estimated cost \$200.

DEL NORTE COUNTY—Application 7513. A. D. Rutherford and Kathryn Rutherford, Crescent City, Cal., for 0.03 c.f.s. from series of springs, tributary to Smith River watershed, to be diverted in Sec. 20, T. 17 N., R. 2 E., H. B. and M. For domestic purposes. Estimated cost \$300.

SAN DIEGO COUNTY—Application 7514. Albert M. Proctor and Mary Moore Proctor, P. O. Box 256, Chula Vista, Cal., for 0.1 c.f.s. from Pringle Canyon, tributary to Dulzura Creek, to be diverted in Sec. 22, T. 17 S., R. 2 E., S. B. B. and M. For power and domestic purposes. Estimated cost \$2,500.

MERCED COUNTY—Application 7515. Gustine Orchard Company, Gustine, Cal., for 15.6 c.f.s. from Los Garzos Creek (Garzas Creek) tributary to San Joaquin River, to be diverted in Sec. 15, T. 8 S., R. 8 E., M. D. B. and M. For irrigation purposes (131 acres). Estimated cost \$750.

EL DORADO COUNTY—Application 7516. B. W. Stone, 161 Ellis Street, San Francisco, Cal., for 500 c.f.s., 125,000 acre-feet per annum, from Rubicon River, Pilot Creek, Gerle Creek, Loom Lake, Buck Island Lake, Rock Bound Lake, Little S. Fork Rubicon River, tributary to American River Drainage area to be diverted in Sec. 9, T. 13 N., R. 16 E.; Sec. 11, T. 12 N., R. 12 E.; Sec. 24, T. 13 N., R. 13 E.; Secs. 11, 31, 34, T. 14 N., R. 14 E.; Sec. 4, T. 13 N., R. 15 E., and Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

BUTTE COUNTY—Application 7517. Franklin Baldwin, c/o James Hopkins, Oroville Inn, Oroville, Cal., for 3.0 c.f.s. from Dry Creek, tributary to Butte Creek, to be diverted in Sec. 1, T. 21 N., R. 3 E., M. D. B. and M. For mining purposes.

SACRAMENTO COUNTY—Application 7518. Frank Boniface, 1825 39th Street, Sacramento, Cal., for 0.05 c.f.s. from Chicken Ranch Slough, tributary to American River, to be diverted in Sec. 23, T. 9 N., R. 5 E., M. D. B. and M. For irrigation purposes. Estimated cost \$100.

LASSEN COUNTY—Application 7519. U. S. Plumas National Forest, c/o D. N. Rodgers, Supervisor, Quincy, Cal., for 0.025 c.f.s. from unnamed spring, tributary to Honey Lake, to be diverted in Sec. 1, T. 26 N., R. 14 E., M. D. B. and M. For domestic purposes. Estimated cost \$360.

INYO COUNTY—Application 7520. Dwight L. Sawyer, Gardena, Cal., for 1.0 c.f.s. from unnamed spring, tributary to Tuber Canyon, thence Panamint Valley, to be diverted in Sec. 4, T. 20 S., R. 44 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$1,500.

SANTA CRUZ COUNTY—Application 7521. Paradise Park Masonic Club, a corporation, c/o Simon M. Collins, Attorney, 14 Cooper Street, Santa Cruz, Cal., for 1.0 c.f.s. from 2 wells, tributary to San Lorenzo River, to be diverted in Sec. 2, T. 11 S., R. 2 W., M. D. B. and M. For domestic purposes.

ALPINE COUNTY—Application 7522. U. S. El Dorado National Forest, Placerville, Cal., for 3400 gallons per day from unnamed stream, tributary to Woods Lake, South Fork of American River, to be diverted in Sec. 28, T. 10 N., R. 18 E., M. D. B. and M. For recreational purposes. Estimated cost \$200.

SIERRA COUNTY—Application 7523. Cal Dodson (Ah Keong), c/o R. F. Taylor, Downieville, Cal., for 0.025 c.f.s. from Graveyard Ravine, tributary to N. Fork Yuba River, to be diverted in Sec. 26, T. 20 N., R. 10 E., M. D. B. and M. For domestic purposes. Estimated cost \$100.

SIERRA COUNTY—Application 7524. S. O. Mitchell and C. A. Scott, 1400 Chapman Building, Los Angeles, Cal., for 10 c.f.s. from First Ravine, tributary to Gibson Creek, Thence Slate Creek and N. Fork Yuba River, to be diverted in Sec. 30, T. 22 N., R. 10 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$2,000.

HUMBOLDT COUNTY—Application 7525. Thomas Nelson McDaniel, 2004 4th Avenue, Seattle, Washington, for 300 c.f.s. from Willow Creek, tributary to Trinity River, to be diverted in Sec. 11, T. 6 N., R. 4 E., H. B. and M. For mining and domestic purposes. Estimated cost \$300,000.

PLUMAS COUNTY—Application 7526. University of California, c/o N. Hovey, Purchasing Agent, Berkeley, Cal., for 5000 gallons per day, from Schneider Creek, tributary to Meadow Valley Creek, Spanish Creek and North Fork Feather River, to be diverted in Sec. 26, T. 24 N., R. 8 E., M. D. B. and M. For domestic and fire protection purposes. Estimated cost \$250.

EL DORADO COUNTY—Application 7527. Fred J. Kaeser, Rescue, Cal., for 2.5 c.f.s. from Wildcat Canyon, tributary to Webber Creek, thence S. Fork American River, to be diverted in Sec. 4, T. 10 N., R. 9 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$300.

LOS ANGELES COUNTY—Application 7528. George E. McCoy, 6161 N. Figueroa Street, Los Angeles, Cal., for 1.0 c.f.s. from unnamed spring (in shaft), tributary to Santa Clara River watershed, to be diverted in Sec. 18, T. 4 N., R. 15 W., S. B. B. and M. For mining and domestic purposes. Estimated cost \$70.

SISKIYOU COUNTY—Application 7529. Gertrude Dowling, Yreka, Cal., for 60 gallons per minute from Devil's Hole Creek, tributary to Scott River, to be diverted in Sec. 26, T. 44 N., R. 11 W., M. D. B. and M. For irrigation and domestic purposes. Estimated cost \$200.

PERMITS ISSUED

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during month of March, 1933.

SACRAMENTO COUNTY—Permit 4072, Application 7414. Issued to U. L. Trussell, 2765 21st Street, Sacramento, Cal., March 8, 1933, for 0.125 second-foot of water from Hough Creek in Sec. 33, T. 26 N., R. 10 E., M. D. B. and M. For use for mining purposes.

TRINITY COUNTY—Permit 4073, Application 7407. Issued to Marion A. Miller, Zenia, Cal., March 14, 1933, for 0.6 of a second-foot from unnamed spring in Sec. 11, T. 3 S., R. 6 E., H. B. and M. For use for agricultural purposes on 30 acres. Estimated cost \$95.

SISKIYOU COUNTY—Permit 4074, Application 7246. Issued to Geo. T. Ostrom, Happy Camp, Cal., March 14, 1933, for 7.5 second-foot from T-Bar Creek, in Sec. 10, T. 13 N., R. 6 E., H. B. and M. For use for power purposes in the development of 383.5 horse power. Estimated cost \$10,000.

SISKIYOU COUNTY—Permit 4075, Application 7247. Issued to Geo. T. Ostrom, Happy Camp, Cal., March 14, 1933, for 7.5 second-foot from T-Bar Creek, in Sec. 10, T. 13 N., R. 6 E., H. B. and M. For use for mining purposes. Estimated cost \$10,000.

SISKIYOU COUNTY—Permit 4076, Application 7343. Issued to Edward C. Baker, Happy Camp, Cal., March 15, 1933, for 1 second-foot from West Branch Indian Creek, in Sec. 23, T. 18 N., R. 6 E., H. B. and M. For use for mining and domestic purposes. Estimated cost \$75.

DEL NORTE COUNTY—Permit 4077, Application 7026. Issued to Harry T. Wilkerson, 1130 West Boulevard, Los Angeles, Cal., March 16, 1933, for 50 second-foot from Hurdy Gurdy Creek, in Sec. 31, T. 16 N.,

Work Advanced to Bids in April

The following projects with an estimated total cost approximating \$532,700 were scheduled for advertising prior to May 1. These improvements comprise three road jobs and two grade separations in five counties.

DETAILED LIST OF PROJECTS

County	Location	Miles	Type
Tulare	Goshen to Plaza Garage	4.2	Pavement
Los Angeles	At Brea Canyon Summit	1.3	Pavement
San Bernardino	At San Bernardino	0.7	Pavement
Santa Clara	Near Morgan Hill		Madrone Crossing
Kern	At Minkler Spur		Separation Grade Separation

SUMMARY

Type	Miles	Amount
Permanent Pavement-----	6.2	\$297,700
Grade Sparations-----	(2)	135,000
Total -----		\$532,700

Water Applications and Permits

(Continued from preceding page)

R. 3 E., H. B. and M. For use for mining and domestic.

DEL NORTE COUNTY—Permit 4078, Application 7198. Issued to Harry T. Wilkerson, 1130 West Boulevard, Los Angeles, Cal., March 16, 1933, for 50 second-feet from Hurdy Gurdy Creek, in Sec. 31, T. 16 N., R. 3 E., H. B. and M. For use for mining and domestic. Estimated cost \$500.

MENDOCINO COUNTY—Permit 4079, Application 7409. Issued to Heath Angelo, Branscomb, Cal., March 17, 1933, for 0.45 of a second-foot from Elder Creek, in Sec. 29, T. 22 N., R. 16 W., M. D. B. and M. For use for irrigation and domestic purposes on 10 acres. Estimated cost \$500.

MENDOCINO COUNTY—Permit 4080, Application 7473. Issued to Heath Angelo, Branscomb, Cal., March 17, 1933, for 2.5 second-feet from Elder Creek in Sec. 29, T. 22 N., R. 16 W., M. D. B. and M. For use for power purposes in development of 2 horsepower. Estimated cost \$500.

LOS ANGELES COUNTY—Permit 4081, Application 7475. Issued to J. F. Hutak, Littlerock, Cal., March 23, 1933, for 0.01 of a second-foot from spring in Sec. 18, T. 4 N., R. 10 W., S. B. B. and M. For use for irrigation purposes on 10 acres. Estimated cost \$250.

SHASTA COUNTY—Permit 4082, Application 7445. Issued to Lovina E. Hull, Big Bend, Cal., March 23, 1933, for 3.0 second-feet from Pit River in Sec. 36, T. 37 N., R. 1 W., M. D. B. and M. For use for power purposes in the development of 3 horsepower. Estimated cost \$410.

PLUMAS COUNTY—Permit 4083, Application 7370. Issued to State Division of Highways, Sacramento, Cal., March 23, 1933, for 0.025 of a second-foot from unnamed spring in Sec. 10, T. 25 N., R. 9 E., M. D. B. and M. For use for industrial and recreational purposes. Estimated cost \$100.

SAN JOAQUIN COUNTY—Permit 4084, Application 7494. Issued to E. E. Hahn, Route 4, Box 153X, Stockton, Cal., March 23, 1933, for 0.5 of a second-foot from French Camp Slough, in Sec. 6, T. 1 S., R. 7 E., M. D. B. and M. For use for irrigation purposes on 30.1 acres. Estimated cost \$1,500.

PLUMAS COUNTY—Permit 4085, Application 7395. Issued to Joseph Perich, 2190 Meyer Street, Oroville, Cal., March 23, 1933, for 1.5 second-feet from Bellbar Creek, in Sec. 17, T. 23 N., R. 11 E., M. D. B. and M. For mining purposes. Estimated cost \$50.

HUMBOLDT COUNTY—Permit 4086, Application 7476. Issued to William Silva and Domingo Silva, Jr., Star Route, Arcata, California, March 23, 1933, for 3 second-feet from Mad River, in Sec. 7, T. 6 N., R. 1 E., M. D. B. and M. For use for irrigation purposes on 100 acres. Estimated cost \$3,000.

HUMBOLDT COUNTY—Permit 4087, Application 7459. Issued to Ralph Coleman, Salyer, Cal., March 31, 1933, for 0.01 of a second-foot from unnamed spring, in Sec. 16, T. 6 N., R. 5 E., H. B. and M. For use for domestic purposes. Estimated cost \$225.

PRECIPITATION AVERAGES BELOW NORMAL

(Continued from page 21)

Ventura County Investigation. Work on estimating reservoir capacities necessary has been continued throughout the month with particular reference to utilization of underground reservoirs in Santa Clara Valley, the Oxnard Plain and in the Ojai Valley. Estimates on comparative desirability of various surface reservoirs on Sespe, Piru and Matilija Creeks have been continued throughout the month.

"Son, you went to bed very early. How was that?"

"Well, daddy, I had a row with your wife."—*The Humorist.*

Anaheim Bay Bridge Nine Inches Shorter After Quake Shocks

(Continued from page 10)

cylinder piers seem to have been left in normal position.

The greatest damage to the bridge is at the lift span, the haunches of the outside girder on the east side being badly cracked, allowing the deck slab to drop about 1" from its original position. There is evidently a heavy pressure on the south abutment of the approach.

PRESSURE AT APPROACHES

In order to make complete repairs, it will be necessary to relieve the end pressure by unloading the south abutment and bulkhead and placing concrete strut bracing. When this pressure is relieved, the gap may be jacked open and the lift span removed and repaired. Other work required will be making gunite repairs to cracks in various parts of the bridge and replacing the lift span.

As was the case with the Anaheim Bay Bridge, the Alamitos Bay Bridge was damaged principally from the pressure exerted on the bulkheads at the approaches, although not nearly so extensively. On the Long Beach end of the bridge the piles have been shoved in 4" to 6" toward the water.

Very little damage has been done the substructure, and what little damage was done the superstructure has been a little spalling and a few cracks at the lift span.

Comparatively little damage was done the San Gabriel River Bridge and only a small amount of gunite repair work will be required.

ENTIRE DAMAGE THIRTY-THREE THOUSAND DOLLARS

Damage to the Surfside pedestrian subway consisted only of a slight displacement of construction joints which permits water to seep into the subway. This can be re-waterproofed at a comparatively slight expense.

It is estimated that the total cost of repairing the three bridges mentioned and the pedestrian subway will not exceed \$10,000.

Taken as a whole, the damage sustained by the State highways in the recent earthquake will be in the neighborhood of \$33,000.

This estimate takes into consideration the cost of elimination of 18,000 square yards

Vital Statistics on Dam Applications and Improvements

APPLICATIONS FILED

Application for approval of dam built prior to August 14, 1929, filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1933.

PLACER COUNTY—Columbian Dam No. 321. B. & N. Corp., Newcastle, owner; earth, 26 feet above stream bed with a storage capacity of 70 acre-feet, situated on a creek tributary to Auburn Ravine in Sec. 16, T. 12 N., R. 7 E., M. D. B. and M. For storage purposes for irrigation use.

Application for approval of plans and specifications for repair or alteration of dam filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1933.

SHASTA COUNTY—Heart Lake Dam No. 224. O. R. Smith, Red Bluff, owner; earth, 38 feet above stream bed with a storage capacity of 1000 acre-feet, situated on North Digger Creek tributary to Battle Creek in Sec. 25, T. 30 N., R. 3 E., M. D. B. and M. For storage purposes for irrigation and domestic use. Estimated cost \$5,900; fee paid \$59.

Application for approval of plans and specifications for repair or alteration of dam filed with the State Department of Public Works, Division of Water Resources, during the month of March, 1933.

SANTA BARBARA COUNTY—Sheffield Dam No. 11-2. City of Santa Barbara, Santa Barbara, owner; earth, situated on Sycamore Creek in city of Santa Barbara.

PLANS APPROVED

Plans for the repair or alteration of dam approved by the State Department of Public Works, Division of Water Resources, during the month of March, 1933.

SANTA BARBARA COUNTY—Sheffield Dam No. 11-2. City of Santa Barbara, Santa Barbara, owner; earth, situated on Sycamore Creek in city of Santa Barbara.

HIGHWAYS AID AVIATORS

More than 500 miles of New Jersey highways have been marked with directional signs for the guidance of air traffic. Seventy signs have been placed at strategic points which show the route number, and indicate by an arrow the magnetic north or east.

"I'm sure I don't know where Betty gets her vile temper from," said mother. "It's certainly not from me."

"You're right, my dear," said father. "You have none of yours missing."—*Answers*.

of depressions in concrete pavement by "mudjacking," 1200 tons of asphaltic per-mix used on bridge approaches and in repairing macadam pavement, and miscellaneous work such as leveling pavement with plant mixed material, raising shoulders and resurfacing them with oil mix in addition to the necessary repair work to bridges.

When this work is completed, there will be no noticeable result of the earthquake other than possibly a slightly rougher condition of the pavement.

Congressman Makes Striking Presentation of Aridity Conditions

(Continued from page 13)

meeting the General departed for Washington, D. C., where he will report his findings to Major General Brown.

As the result of Governor Rolph's wires to Washington Congressman C. F. Lea called a meeting of California's representatives, who immediately gave their wholehearted support to putting the Water Plan Project into the program of public works for the relief of unemployment.

A striking presentation of the situation was made in the following paragraph of a letter sent by Congressman H. E. Stubbs of Santa Maria to President Roosevelt:

DRAMATIC PICTURE

"The state-wide water plan of California, as you know, would rehabilitate a great area, which now is slowly becoming an arid waste in what once was considered a veritable Eden. This is taking place slowly—if it were to happen overnight, the nation would become alarmed, the Red Cross and other emergency relief organizations would rush to the rescue, Presidential edicts would be issued hourly, and other emergency measures generally associated with a calamity of national import would be effected. It means nothing to millions in other states, Mr. President, but it means life to the residents of the great valley area."

The War Department already has rendered a partial report on the project and has recommended Federal participation in the interest of navigation. The final report of the Division Engineer, Colonel Robins, is now before the Board of Engineers for Rivers and Harbors that inspected the project in November, 1932. The report will be transmitted by that board with its recommendations to the Chief of Engineers, Major General Brown, for his review and recommendations. He will forward it to the Secretary of War for transmittal to Congress.

TUNNEL THROUGH MOUNTAIN

A tunnel 1085 feet long on a $2\frac{1}{2}$ degree curve with a grade of 1 per cent was recently built on the Umpqua Highway in Oregon when it was shown that the tunnel alignment would give a length of 1.6 miles as compared with a length of $5\frac{1}{2}$ miles and a climb of 3 miles of grade in crossing the ridge. This tunnel is on a 50-mile link that connects the Pacific Highway and the Coast Highway.

New State Armory to be Built in San Jose for 159th Infantry

(Continued from page 5)

sons which is designed primarily for observation and review of maneuvers on the drill hall floor. It will also serve the public during athletic games or other events held in the armory.

At the east side of the drill hall along the rear property line are located store rooms for the equipment of each company and on the second floor over the store rooms a rifle range for target practice.

With the exception of the steel trusses supporting the drill hall roof all structural portions of the building from the foundations to and including the roof slab will be of reinforced concrete. Inasmuch as there is no public auditorium in the city of San Jose at the present time the armory building will undoubtedly be used for public functions and the safety to the public afforded by the materials used and the soundness of the design are of primary interest.

When the building is completed the 159th Infantry will have headquarters unexcelled by any unit of its size in the State.

ROADSIDE BEAUTIFICATION REPORT SENT TO LEGISLATURE

(Continued from page 6)

funds permit and that due consideration be taken of highway construction and maintenance needs.

It is recommended that the present policy relative to tree planting and planting at approaches to towns be continued, to wit: That the individual or organization desiring the planting shall bear the expense of such planting and the cost of maintenance for the first year. After the first year the Division of Highways is to assume the entire cost of replacement and upkeep.

It is recommended that the present program of caring for and protecting native roadside trees be continued and expanded as funds permit.

Client: "I'm looking for a governess for my children."

Manager of Employment Bureau: "Didn't we supply you with one last week?"

"Yes."

"Well, madam, according to her report you don't need a governess. You need a lion-tamer."—*Tit Bits*.

Road User Pays Bill for the State

(Continued from page 17)



AN UNIMPROVED ROAD IN THE SIERRAS

ment of the connecting routings within and through cities will afford substantial relief to these cities. The routes connecting existing State highways and those portions of the additional roads proposed for inclusion which lie within the city boundaries, will constitute a considerable mileage of city streets. The total length of these routings within cities is 855 miles. * * *

Inclusion of additional roads must be considered on the basis of present revenues accruing to the State for highway purposes, since no additional revenues are to be provided for that purpose.

Actually the State highway revenues, as estimated for the next biennium, have already been reduced by 13 per cent in the loss of Federal aid. A reduction in traffic volume of the past several years, accompanied by a consequent decrease in gas tax revenues must also be considered.

It is perfectly evident from a study of highway finances that additional road mileage as proposed in the resolution can not be added if further reduction in highway revenues should be made in addition to the loss of \$8,000,000 of Federal aid which has already occurred.

Even the most elementary economic considerations

of the counties, not only for improvement but for maintenance also, because these are evidently the roads which must carry the larger volume of traffic.

The 2539 miles proposed for inclusion is 11.4 per cent of the total surfaced county road mileage, while the 6600 miles proposed for inclusion is 29.5 per cent. Considered in this light, a materially different picture is presented as to the measure of relief which may be afforded to the counties by the inclusion of roads in the State highway system.

In the same manner, the assumption of maintenance and improve-



DESERT CONDITIONS

lead to the conclusion that the State must protect the large investment it now has in its present State highway system. Maintenance of the roads alone will not offer this protection. It requires, in addition, a certain amount of reconstruction and rebuilding where the original old roads have failed and where maintenance would be entirely inadequate to restore the facilities and most certainly uneconomical.

The road user pays the bill for an improvement which is of benefit to the State as a whole. He is certainly entitled to some measure of adequate compensation for his contribution.

(Continued on page 27)

National Park Approaches Included

(Continued from preceding page)

It is estimated that maintenance and minor improvement of the roads proposed for addition will average approximately \$500 a mile per year. Some roads with better type of surface are in good condition, and traffic requirements can be met by general maintenance expenditure alone. However, many of the roads proposed for inclusion are in a condition requiring at least minor improvement to make them adequate for service.

SIX MILLION DOLLARS CITY COST

The cost of maintaining and improving city routings will approximate \$6,000,000 for the biennial period and will cause a corresponding reduction in the funds available for construction on State highways.

The roads recommended in the Commission's report tabulated by counties and showing the approximate mileage are as follows:

County	Description	Miles	County	Description	Miles
			Butte, Tehama	State Highway Route 3 near Chico to State Highway Route 29 near Deer Creek Meadows----	56.0
			Colusa, Glenn	State Highway Route 15 near Colusa to State Highway Route 47 near Hamilton City-----	33.0
			Butte	State Highway Route 3 near Chico to State Highway Route 21 near Oroville-----	17.0
			Yuba, Butte	State Highway Route 15 near Marysville to State Highway Route 21 near Oroville-----	26.0
			Nevada, Placer	State Highway Route 37 near Colfax to State Highway Route 17 near Grass Valley-----	12.0
Del Norte	State Highway Route 71 to State Highway Route 1 north of Smith River---	7.0	Sierra, Nevada, Plumas	State Highway Route 21 near Blairsden to State Highway Route 38 near Truckee-----	47.0
Siskiyou	Etna Mills to Montague--	35.0	Sierra	State Highway Route 25 at Downieville to Blairsden-Truckee Road near Sattley-----	31.0
Humboldt	State Highway Route 20 near Willow Creek to State Highway Route 46 near Weitchpec-----	27.0	Sonoma, Mendocino	Russian River near Jenner to Westport-----	122.0
Shasta, Siskiyou	State Highway Route 3 near Mt. Shasta to Lassen National Park-----	93.0	Lake	State Highway Route 49 near Middletown to State Highway Route 15 near Upper Lake through Lakeport-----	42.0
Lassen, Modoc	State Highway Route 28 near Alturas to State Highway Route 29-----	101.5	Yolo, Sutter	State Highway Route 7 near Woodland to State Highway Route 15 near Yuba City-----	38.0
Humboldt	State Highway Route 1 to State Highway Route 20 north of Mad River-----	2.0	Sonoma	Coast road near Jenner to State Highway Route 1 near Cotati-----	38.0
Trinity, Humboldt	Ferndale to State Highway Route 1 near Fernbridge--	5.0	Sonoma, Napa	Calistoga to State Highway Route 1 near Geyserville--	24.0
Trinity	State Highway Route 1 to State Highway Route 35 near Kuntz-----	52.0	Napa	State Highway Route 8 near Napa to State Highway Route 49 near Calistoga-----	28.0
Trinity	State Highway Route 35 near Peanut to State Highway Route 20 near Douglas City-----	28.0	Sonoma, Napa	State Highway Route 8 to State Highway Route 74--	12.0
Trinity, Shasta, Tehama, Shasta	State Highway Route 35 to State Highway Route 3 near Red Bluff-----	65.0	Sonoma	State Highway Route 1 near Petaluma to State Highway Route 3 near Shellville-----	19.0
	State Highway Route 28 near Redding to Lassen National Park-----	50.0		Sebastopol to State Highway Route 1 near Santa Rosa-----	7.0
Tehama	Lassen National Park to State Highway Route 29 near Morgan-----	8.0	Napa, Yolo	Napa-Calistoga road near Rutherford to Winters--	40.0
Plumas	State Highway Route 29 near Deer Creek Meadows to State Highway Route 21 near Indian Falls----	35.0			

(Continued on page 28)

Important Inter-State Links Added

(Continued from page 27)

County	Description	Miles	County	Description	Miles
Napa	State Highway Route 8 near Napa to the Rutherford-Winters Road -----	18.0	Alameda	San Leandro to Haywards. Mt. Eden road to State Highway Route 5 near Haywards -----	5.0 4.0
Yolo	State Highway Route 50 near Rumsey to State Highway Route 7 near Woodland -----	33.0	Santa Clara	State Highway Route 68 near Sunnyvale to Los Gatos-Saratoga Gap Road -----	8.0
Solano	State Highway Route 53 to State Highway Route 7 near Dixon -----	20.0	Santa Cruz, San Mateo San Francisco	Santa Cruz to San Francisco -----	92.0
Sacramento	State Highway Route 11 near Perkins to State Highway Route 54 near Michigan Bar -----	21.0	Santa Cruz	State Highway Route 5 near Santa Cruz to State Highway Route 42 near Waterman Gap -----	23.0
Sacramento, Yolo	Woodland to Sacramento--	19.0	San Mateo	Coast Road near Half Moon Bay to State Highway Route 2 near San Mateo--	9.0
Solano	State Highway Route 7 near Vacaville to State Highway Route 7 near Dunnigan -----	37.0		State Highway Route 55 to State Highway Route 2 near Menlo Park-----	14.0
Contra Costa, Sacramento	Antioch Bridge Junction to Sacramento -----	49.0	Contra Costa	State Highway Route 14 near Hercules to the Walnut Creek-Antioch Road--	16.0
Placer	State Highway Route 3 near Lincoln to State Highway Route 71 near Newcastle -----	10.0	Santa Clara	State Highway Route 2 near Mountain View to State Highway Route 5 near Milpitas-----	11.0
Sacramento	State Highway Route 4 south of Sacramento to State Highway Route 3 near Ben Ali-----	13.0		State Highway Route 55 near Saratoga Gap to State Highway Route 5 near Los Gatos-----	11.0
San Joaquin, Amador	State Highway Route 4 near Stockton to State Highway Route 54-----	38.0	Alameda, Contra Costa	San Jose to Richmond-----	39.0
El Dorado	State Highway Route 65 near Coloma to Marshall's Monument -----	0.8	Contra Costa, San Joaquin	State Highway Route 75 near Walnut Creek to Stockton via Antioch----	58.0
	State Highway Route 11 near El Dorado to State Highway Route 11 near Placerville via Diamond Springs -----	5.0	Alameda, Contra Costa	State Highway Route 75 near Walnut Creek to Livermore-San Jose Mission Road near Scotts Corners -----	24.0
Mono	State Highway Route 23 near Bridgeport to the California-Nevada State line via Walker River---	16.0	Alameda	State Highway Route 5 near Mission San Jose to State Highway Route 5 near Livermore -----	15.0
Alpine	State Highway Route 23 near Woodfords to the California-Nevada State line -----	7.0	Santa Clara	State Highway Route 5 near San Jose to Mount Hamilton -----	26.0
Mono	State Highway 23 near Coleville northerly to California-Nevada State line -----	11.0	Stanislaus, Merced, Tuolumne, Mariposa	West Side Highway near Westly to the Sonora-Mariposa Road via Modesto -----	73.0
Marin	Marin Peninsula to the Marin - Sonoma County line via the Coast Route--	53.0	San Joaquin, Stanislaus	State Highway Route 4 near Manteca to State Highway Route 13 near Oakdale -----	21.0
San Joaquin, Calaveras	State Highway Route 4 near Stockton to State Highway Route 65 near Mokelumne Hill-----	43.0	San Joaquin, Stanislaus	State Highway Route 4 near Stockton to State Highway Route 13 near Knights Ferry-----	35.0

Death Valley to Get State Highway

(Continued from preceding page)

County	Description	Miles	County	Description	Miles
Stanislaus, Merced	West Side Highway near Newmans to State High- way Route 4 near Liv- ingston -----	20.0	Monterey, Santa Cruz	State Highway Route 56 near Carmel to Santa Cruz -----	53.0
Merced	State Highway Route 32 west of Los Banos to West Side Highway near Centinella -----	3.0	Monterey	Coast Road near Catsro- ville to State Highway Route 2 near Prunedale..	5.0
	State Highway Route 4 near Merced to Snelling..	18.0	Santa Clara, San Benito, Monterey	State Highway Route 2 near Gilroy to State Highway Route 10 in Priest Valley-----	80.0
Tuolumne, Mariposa	State Highway Route 40 near Moccasin Creek to State Highway Route 18 near Mariposa-----	39.0	Fresno, Madera	Fresno-Tracy Road near Kerman to State High- way Route 4 near Madera	15.0
Merced	State Highway Route 4 near Merced southerly to State Highway Route 32..	15.0	Tulare	Orosi to Bakersfield-Gen- eral Grant Park Road---	11.0
Mono	State Highway Route 23 via June Lake to State Highway Route 23-----	16.0	Tulare, Kings	Corcoran to Lindsay-----	33.0
	State Highway Route 23 near Mono Lake to State Highway Route 76 near Benton Station-----	45.0	Tulare	State Highway Route 4 near Tulare to Orange Cove -----	24.0
Inyo	State Highway Route 23 to Camp Sebrina-----	20.00	Fresno	Visalia to Woodlake-----	13.0
Mono	State Highway Route 23 to Mammoth Lakes-----	10.0	Madera	State Highway Route 4 near Fresno to General Grant National Park---	60.0
San Joaquin, Stanislaus, Merced, Fresno	State Highway Route 4 near Fresno to State Highway Route 5 near Tracy -----	127.0	Fresno, Tulare	State Highway Route 4 near Kingsburg to State Highway Route 10 near Lemoncove -----	39.0
Fresno, Madera, Mariposa	State Highway Route 4 near Fresno to Yosemite National Park-----	76.0	Inyo, Tulare	Corcoran-Alpaugh Road, via Porterville to Camp Nelson and from Lone Pine to Mt. Whitney-----	73.0
Fresno	The Fresno-Yosemite Road near Lanes Station to Huntington Lake-----	60.0	Inyo	State Highway Route 23 near Owens Lake to Death Valley-----	118.0
San Benito, Monterey	State Highway Route 2 near Soledad to Pinnacles National Monument and Pinnacles National Monument to Hollister- Priest Valley Road in Bear Valley-----	16.0	Kern, San Luis Obispo, Fresno, Kings	State Highway Route 56 near Moro to State High- way Route 4 near Fresno	125.0
Monterey	Monterey to State Highway Route 2 near Salinas---	18.0	Kern, Fresno, Kings	State Highway Route 57 near Maricopa to State Highway Route 10 near Coalinga -----	99.0
	State Highway Route 2 near Salinas to Coast Road near Castroville---	9.0	Tulare, Kings	Hanford via Corcoran and Earlimart to Bakersfield- General Grant Park Road near Ducor-----	59.0
Santa Cruz	State Highway Route 67 near Chittenden to the Coast road near Watson- ville -----	10.0	Kern, Tulare, Fresno	State Highway Route 4 near Bakersfield to Gen- eral Grant National Park	109.0
Santa Cruz, Santa Clara	Coast Road near Watson- ville to State Highway Route 2 in Santa Clara Valley via Hecker Pass..	21.0	Inyo, San Bernardino	State Highway Route 31 to Death Valley and con- nection to California-Ne- vada State line-----	117.0
San Benito	State Highway Route 22 near San Juan Bautista to State Highway Route 2 near The Rocks-----	3.0	San Luis Obispo	State Highway Route 2 near Arroyo Grande to State Highway Route 2 near San Luis Obispo----	12.0

(Continued on page 30)

San Joaquin Valley and Coast Linked

(Continued from page 29)

County	Description	Miles	County	Description	Miles
San Luis Obispo	State Highway Route 2 near Santa Margarita to Moro-Fresno Road near Creston	12.0	Santa Barbara, Ventura	Santa Barbara to State Highway Route 79 near Santa Paula.....	48.0
San Luis Obispo, Kern	State Highway Route 2 near Santa Margarita to State Highway Route 4 near Bakersfield.....	110.0	Santa Barbara, Ventura, San Luis Obispo	State Highway Route 2 near Ventura to State Highway Route 57 in Cuyama Valley.....	70.0
Kern	Taft to State Highway Route 4 near Greenfield..	29.0	Santa Barbara	State Highway Route 2 near Montecito to State Highway Route 2 west of Santa Barbara via the Coast	9.0
	State Highway Route 4 near Delano to Bakersfield-General Grant Park Road	8.0		State Highway Route 2 near Carpinteria to the Carpinteria Beach State Park	0.5
	Taft-Greenfield Road to State Highway Route 33 near Wasco	25.0	Ventura	State Highway Route 2 near El Rio to Montalvo-San Fernando Road near Saticoy	4.0
	State Highway Route 4 near Bakersfield to State Highway Route 57 near Isabella via Glennville..	66.0		The Montalvo-San Fernando Road near Saticoy to State Highway Route 79..	1.3
	State Highway Route 4 south of Bakersfield to State Highway Route 58 via Arvin.....	24.0	Santa Barbara	State Highway Route 80 to State Highway Route 2 via Foothill Road.....	8.0
	Arvin road near Weed Patch to State Highway Route 57 near Loma Park	10.0	Ventura	Hueneme to Somis via Oxnard and Camarillo.....	18.0
	Cummings Valley State Institution to State Highway Route 58 near Old Town	7.0	Ventura, Los Angeles	State Highway Route 2 near Montalvo to State Highway Route 4 near San Fernando.....	51.0
	State Highway Route 4, via Brundage Lane and Oak Street to State Highway Route 4 near Beardsley School	6.0	Los Angeles	Lankershim Boulevard from State Highway Route 2 near Universal City to State Highway Route 4..	7.0
Inyo, Kern, San Bernardino	State Highway Route 31 near Cajon Pass to State Highway Route 23 near Little Lake.....	109.0		State Highway Route 4 near Cahuenga Park to State Highway Route 4 near Burbank	10.0
San Bernardino	State Highway Route 58 west of Needles to the California-Nevada State line	20.0		State Highway Route 4 near Glendale to State Highway Route 9 near Monrovia	17.0
Santa Barbara	The coast near Surf to State Highway Route 80 near Santa Ynez.....	34.0		State Highway Route 60 at Santa Monica to Colorado Boulevard in Los Angeles	21.0
Santa Barbara, San Luis Obispo	State Highway Route 2 near Las Cruces to State Highway Route 2 near Pismo	67.0		State Highway Route 4 near Burbank to Dayton Ave., Los Angeles, via Riverside Drive.....	10.0
Santa Barbara	Sisquoc to the Coast Road near mouth of Santa Maria River via Santa Maria	25.0		Los Angeles (Aliso Street) to State Highway Route 26 near Monterey Park via Ramona Blvd.....	6.0
	Harris to State Highway Route 2 near Los Alamos	9.0		State Highway Route 4 near Tunnel Station to State Highway Route 9 near San Fernando.....	8.0
	Orcutt to State Highway Route 2 south of Santa Maria	5.0			

San Bernardino Mountain Area Listed

(Continued from preceding page)

County	Description	Miles	County	Description	Miles
Los Angeles—Continued	State Highway Route 60 near Topanga Beach to Montalvo-San Fernando Road near Chatsworth	22.0	Los Angeles	State Highway Route 60 near Long Beach to State Highway Route 9 near Lamanda Park	27.0
Los Angeles, Ventura	State Highway Route 60 near Aliso Canyon to State Highway Route 2 near Triunfo	12.0	Los Angeles	San Pedro to State Highway Route 9 near La Canada via Figueroa Street	36.0
Los Angeles	San Fernando Road to State Highway Route 9 via Verduga Wash	9.0		State Highway Route 4 near San Fernando to State Highway Route 60 near Mines Field	29.0
Ventura	State Highway Route 2 near Newberry Park to State Highway Route 79 near Fillmore	21.0		Los Angeles, Indiana and Third Streets, to the Huntington Beach-Whittier Road near Santa Fe Springs	12.0
Los Angeles	State Highway Route 23 near Palmdale to Swartout Valley	39.0		Long Beach via Atlantic Boulevard to State Highway Route 26 near Monterey Park	28.0
San Bernardino	State Highway Route 9 near Etiwanda to State Highway Route 31 in Cajon Canyon	12.0		State Highway Route 60 at Torrance via Hawthorne Avenue to Mines Field-San Fernando Road	15.0
	State Highway Route 43 near Mt. Anderson to the Cajon Pass-Lake Arrowhead Road	16.0		Los Angeles, Boyle Avenue and Fourth Street, to State Highway Route 19 near Walnut Station	30.0
	State Highway Route 31 near Cajon Pass to State Highway Route 43 via Lake Arrowhead	32.0	Los Angeles, Orange	Long Beach-Santa Ana Road near Seal Beach via Santa Fe Springs, to State Highway Route 26 near West Covino	24.0
	State Highway Route 26 near Colton to State Highway Route 9 near San Bernardino via Mt. Vernon Avenue	2.0	Los Angeles, Orange	Buena Park to State Highway Route 9 near Azusa	21.0
San Bernardino, Los Angeles	State Highway Route 61 to State Highway Route 59 via Los Angeles County Park	50.0	San Bernardino	State Highway Route 77 via Euclid Avenue to Highland Avenue in Upland	13.0
Los Angeles, San Bernardino	State Highway Route 9 near San Dimas to State Highway Route 26 near Redlands via Highland Avenue	49.0	Riverside, San Bernardino	State Highway Route 43 near Santa Ana Canyon to State Highway Route 9 near San Bernardino (north of Santa Ana River)	24.0
San Bernardino	State Highway Route 31 near Verdemont to Highland Avenue, San Bernardino, via Little Mountain	8.0	San Bernardino	State Highway Route 26 near Whitewater to the Cajon Pass-Baldwin Lake Road	70.0
	State Highway Route 26 near Redlands to State Highway Route 43 near Big Bear Lake via Barton Flats	45.0	Riverside, San Bernardino	State Highway Route 64 near Blythe to State Highway Route 58 near Needles	92.0
	State Highway Route 31 near Cajon Pass to State Highway Route 43 near Big Bear Lake via Baldwin Lake	47.0	Los Angeles Orange	Cerritos Avenue to State Highway Route 43 near Olive via Anaheim	18.0
	A highway around Big Bear Lake connecting State Highway Route 43	6.0	Los Angeles Orange	Los Angeles, near Compton, to State Highway Route 2 near El Toro	34.0

(Continued on page 32)

Southern Coast Extensions Planned

(Continued from page 31)

County	Description	Miles	County	Description	Miles
Los Angeles, Orange	State Highway Route 60 near Huntington Beach to Whittier-----	25.0	Riverside	Hemet to State Highway Route 19 near Moreno----	21.0
Los Angeles, Orange	State Highway Route 60 near Hermosa Beach to State Highway Route 43 in Santa Ana Canyon----	38.0	Riverside	State Highway Route 26 near Whitewater to State Highway Route 26 west of Mecca, south of White- water River-----	35.0
Los Angeles	State Highway Route 60 near El Segundo to Nor- walk -----	18.0		The Descanso - Temecula Road near Aguanga to Hemet -----	23.0
Los Angeles, Orange	Atlantic Avenue in Long Beach to State Highway Route 2 near Santa Ana--	17.0	Imperial, San Diego	Julian to State Highway Route 26 near Kane Springs -----	52.0
Los Angeles, Orange	State Highway Route 60 via Manchester Avenue to State Highway Route 2 near Miraflores-----	38.0	Imperial, Riverside	State Highway Route 26 near Indio to State High- way Route 26 near Braw- ley via north shore of Salton Sea-----	75.0
Orange	State Highway Route 2 near Pickering Corners to State Highway Route 43 in Santa Ana Canyon--	11.0	Riverside	County line near Palo Verde to State Highway Route 64 near Blythe----	20.0
Orange, Riverside	State Highway Route 2 near San Juan Capistrano to State Highway Route 77 near Lake Elsinore---	32.0	Riverside, San Diego	State Highway Route 12 near Descanso to State Highway Route 77 near Temecula -----	86.0
Orange, San Bernardino	State Highway Route 19 near Brea to State High- way Route 77 near Chino	13.0	San Diego	State Highway Route 12 near El Cajon to the Descanso-Temecula Road near Santa Ysabel-----	37.0
San Diego	State Highway Route 2 near Oceanside to State Highway Route 77 near Vista -----	9.0	Imperial	Calipatria to Alamoria---	15.0
Orange	Santa Ana to Pickering Corners-Santa Ana Can- yon Road near Yorba Linda -----	11.0	San Diego	Coronado Ferry in Coro- nado to State Highway Route 2 via Silver Strand	16.0
	State Highway Route 60 near Laguna Beach to State Highway Route 2 near Irvine-----	9.0		State Highway Route 2, Atlantic Street, San Di- ego, to Old Spanish Light House, Point Loma-----	8.0
	State Highway Route 2 near Orange to Orange County Park-----	7.0		State Highway Route 2 near San Diego to State Highway Route 12 west of Jacumba-----	66.0
	State Highway Route 60 near Corona del Mar to Santa Ana via Main Street -----	10.0	Imperial	The San Diego-Campo Road near Spring Valley to State Highway Route 12 near La Mesa-----	1.0
Riverside	State Highway Route 78 near Perris to State Highway Route 26 near Indio -----	83.0		State Highway Route 26 near Brawley to State Highway Route 27 near Holtville -----	21.0
San Diego	State Highway Route 2 near Oceanside to Julian- Temecula Road near Lake Henshaw-----	51.0		State Highway Route 26 near Calexico to State Highway Route 27 near Midway Wells-----	24.0
	State Highway Route 77 near Escondido to the El Cajon-Santa Ysabel Road near Ramona-----	18.0		State Highway Route 12 near Seeley to State Highway Route 26 near Calexico -----	18.0
				State Highway Route 27 near Holtville to Calex- ico-Midway Wells Road near Roads Corners----	9.0

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

EARL LEE KELLY-----Director

ERIC CULLENWARD-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

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TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
FRANK A. TETLEY, Riverside
DR. W. W. BARHAM, Yreka
C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary
HUGH K. McKEVITT, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

G. T. MCCOY, Principal Assistant Engineer
L. V. CAMPBELL, Office Engineer
T. E. STANTON, Materials and Research Engineer
FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST, Acting Bridge Engineer
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

DISTRICT ENGINEERS

H. S. COMLY, District I, Eureka
F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Sacramento
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
E. E. WALLACE, District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
J. W. VICKREY (Acting), District IX, Bishop
R. E. PIERCE, District X, Sacramento
General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

EDWARD HYATT, State Engineer, Chief of Division
J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water
Rights
A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water
Supervisor
GORDON ZANDER, Adjudication, Water Distribution
KATHERINE A. FEENY, Chief Clerk
MABEL PERRYMAN, Secretary

DIVISION OF ARCHITECTURE

GEO. B. McDOUGALL, State Architect, Chief of
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W. K. DANIELS, Administrative Assistant
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HEADQUARTERS

H. W. DeHAVEN, Supervising Architectural Drafts-
man
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification
Writer
C. E. BERG, Supervising Estimator Building Con-
struction
J. W. DUTTON, Principal Engineer, General Con-
struction
W. H. ROCKINGHAM, Principal Mechanical and
Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed
Port of San Diego—Edwin P. Sample

CALIFORNIA

HIGHWAYS and PUBLIC WORKS



Official Journal of the Department of Public Works
MAY-JUNE State of California 1933

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\$61,400,000 Sale of Bay Bridge Bonds State's Biggest Deal in 1933

Record Purchase by Reconstruction Finance Corporation
Makes \$2,000,000 as Cash Installment
Immediately Available for Work

By **EARL LEE KELLY**, Director of Public Works

THE culmination of years of thought and work on the problem of financing a bridge over San Francisco Bay came quietly and unostentatiously in Sacramento on Friday, April 27, 1933, in the office of the Director of Public Works, upon the receipt of a telegram addressed to Governor James Rolph, Jr., and signed by H. A. Mulligan, treasurer of the Reconstruction Finance Corporation, offering to purchase at par value \$61,400,000 worth of five per cent bonds against the revenues of the San Francisco-Oakland Bay Bridge.

This was easily the biggest deal put over in the United States that day. It was larger even than the day's receipts on the New York Stock Exchange. It was a real cash deal, as far as the Reconstruction Finance Corporation was concerned, because even more actual cash than we need is available and is now being transferred to California banks to provide work for men and business for merchants.

Immediately upon receiving this bid, Governor James Rolph, Jr., assembled the members of the California Toll Bridge Authority and, there being no other bidders, the bid of the Reconstruction Finance Corporation was accepted.

I then notified Chief Engineer C. H. Purcell that we had sold the bonds to the Reconstruction Finance Corporation, and he proceeded to requisition the first money needed to start the big double-decked bridge—easily the greatest bridge in the world—which will connect San Francisco and Oakland.

On the following day, April 28, at a meeting of the low bidders in my office I awarded construction contracts aggregating \$36,000,000 to the five successful competitors represented by Edward J. Schneider, Columbia Steel Corporation (two contracts); C. C. Horton, Healy-Tibbitts Construction Company; Henry J. Kaiser, Bridge Builders, Inc.; Albert Huber, Clinton Construction Company and Allan McDonald, Transbay Construction Company.

Present at the meeting to witness the informal ceremony of awarding the bids were Henry J. Brunier, consulting engineer of the bridge;

Charles E. Andrew, assistant chief engineer; Harrison S. Robinson president of the Financial Advisory Committee; George McCoy, principal assistant engineer, Division of Highways and C. C. Carleton, Chief of the Division of Contracts and Rights of Way.

Those of us so close to this great picture can not realize its magnitude. Even though

THREE EPOCHAL EVENTS

April 27—Meeting of California Toll Bridge Authority called by Governor Rolph accepts bid of Reconstruction Finance Corporation for San Francisco-Oakland Bay Bridge bonds in sum of \$61,400,000.

April 28—Director Earl Lee Kelly awards six construction contracts totaling \$36,000,000.

May 9—Toll Bridge Authority requisitions cash installments aggregating \$6,000,000.

State Cooperative Highway Funds Shared by 33 Cities During Biennium

DEVELOPMENT of present-day standards on modern interlacing highway systems has been a matter of rapid growth within the last twenty years. The standards of width, alignment, grade and surface type which now obtain on great mileages of State highways in California are evidence of the rapidity of this growth.

During the early days of State highway activity the need of bringing to adequate standards long stretches of highway which connect the many metropolitan and urban communities left the responsibility of improvement of routings through incorporated cities to the communities. But with the increase of improved mileage on State highways and as longer stretches of continuous pavement were constructed, the short sections of unpaved or deteriorated pavement through communities which were financially unable to improve their streets brought the subject of State cooperation with cities and counties forcibly to public attention.

IMPORTANT TO SYSTEM

There are over two hundred cities connected by the California State highway system and in many instances city streets within their limits are important links in the State road system. The condition of such streets is a vital factor to the highway network. The aggregate length of these links within municipalities is 457 miles, or about 6 per cent of the total mileage of State highways.

As the chief function of the State system is to provide adequate and ample intrastate traffic facilities and as a considerable portion of traffic using State routes through municipalities is not of a local nature, the State recognizes its responsibility for a share in the improvement of these links within cities. The municipalities are responsible for the share of improvement chargeable to local traffic.

In 1925, legislation provided for expenditures of State highway funds within the limits of towns of less than 2500 population and by authority of chapter 807, Statutes of 1931, the authority of the California Highway Commission was broadened and the State was given a definite responsibility in the construction of

State highway routings through municipalities regardless of size.

This 1931 legislation provided certain procedure as a guide for the basis of cooperation between the State and the municipality.

FUNDS SET UP

Upon the authority of chapter 807, the State set up funds for the current biennium amounting to \$2,406,000 to be used for cooperative construction. Many proposals for such work from local authorities were considered and to date, construction has been completed, or is now under way, on projects covering improvement to the streets of twenty-three separate communities. These projects have included work on 35.3 miles of streets and the construction of nine bridges. For these improvements, the State has contributed the sum of \$1,941,352.42. Other proposed cooperative projects, whose total is in excess of the funds remaining, are now pending.

The basis of cooperation is an individual problem for each project and the equitable distribution of costs is determined by conferences of Division of Highway engineers with the local authorities of the petitioning community. However, with full realization of the dual responsibility of State and municipality and on the authority of the 1931 legislation, the Highway Commission has evolved a policy of cooperation which includes as its basis the following general rules:

GENERAL RULES ADOPTED

1. The inception of the improvement and request for participation by the State must be instituted by the municipality.
2. The routing and design of the proposed improvement must be mutually satisfactory to the municipality and the State.
3. The city must provide, unencumbered, all of the right of way; provide for the construction, removal, alteration and adaption of existing and future utilities under municipal jurisdiction, such as water and sewer lines, pole lines, etc., within the right of way; construct curbs and sidewalks and additional desired width of pavement or surfacing not improved by the State.

(Continued on page 17)



SEVENTY-SIX FEET WIDE, the new concrete pavement of the Stockton-Sacramento arterial through the city of Lodi renders traffic congestion practically impossible on this busy highway. The State paid for 40 feet of this cooperative project.



STATE CONTRIBUTED \$15,000 for construction of this 56-foot concrete pavement approximately a mile long through Oakdale on the Sonora Pass lateral in cooperation with the city.

IN GLENDORA

the Foothill Boulevard was graded 60 feet wide and surfaced with 40-foot concrete pavement for 1.5 miles, in cooperation with Los Angeles County by which the State paid approximately \$50,000.



Fulfillment of Bridge Dream at Hand

(Continued from page 1)

we will not require the entire \$61,400,000 for the bridge proper (the cost having been reduced by low bidding to approximately \$55,000,000) this money, distributed into the hands of labor and thence to the material dealers, and thence again into labor and retail trade, will make a ripple that each Californian will feel during the ensuing three years. In addition, \$10,000,000 will be invested in interurban installations on the bridge, and \$6,600,000 in the construction of the approaches.

REMOTE BEGINNINGS

I am informed that as early as 1850 a San Francisco City Council discussed the need of a bridge across San Francisco Bay, and the realization of that bridge seemed just as far away in 1925 (75 years later) as it was when the San Francisco city fathers first discussed this, then impossible, project.

It is interesting to note the steps toward this great achievement.

More than three years ago Governor Rolph, then the Mayor of San Francisco, signed an appropriation providing \$40,000 with which to make surveys and borings to find where the bay floor was best suited to support a bridge.

If we are to select the point at which the bridge reached a concrete stage it would be on Friday, May 13, 1932, when Governor James Rolph, Jr., appointed the Governor's Financial Advisory Committee to the San Francisco-Oakland Bay Bridge, and which consists of:

GOVERNOR'S ADVISORY COMMITTEE

Harrison S. Robinson of Oakland, President

Leland W. Cutler of San Francisco, Vice President

C. H. Purcell of Sacramento, Secretary

Geo. T. Cameron, San Francisco	R. H. Glassley, Oakland
Joseph Carlston, Oakland	E. C. Holmes, Berkeley
C. O. Conrad, Oakland	Jos. R. Knowland, Oakland
W. W. Crocker, San Francisco	F. C. MacDonald, San Francisco
E. B. DeGolia, San Francisco	P. H. McCarthy, San Francisco
R. M. Fitzgerald, Oakland	J. H. Quinn, Oakland
Herbert Fleishhacker, San Francisco	J. P. Symes, San Francisco
A. P. Giannini, San Francisco	Geo. Tourny, San Francisco

As early as 1921 the San Francisco Motor Car Dealers, under the leadership of Billy Hughson, spent \$12,000 for preliminary borings by Ralph Modjeski and John Vipond Davies, which proved that there was rock beneath the surface of the bay at a reasonable distance.

Governor Rolph realized that despite all of the promotion and despite all of the engineering information obtained there could be no progress toward ultimate success until the most capable and experienced business men of San Francisco and Oakland were called in to work out the greatest problem in the construction of a bridge—that of financing the project.

With all the work done on the bridge prior to the appointment of this committee by the Governor, it still would have been merely a dream, though it were a dream based upon exact engineering calculations and surveys. True, the routes across the bay had been studied, costs had been estimated, but we lacked the \$71,000,000 needed, and had no more productive ideas for getting it than they had in 1850 when the Forty-niners idly discussed a bridge across San Francisco Bay.

ONE HUNDRED PER CENT AMERICAN

Now our major contracts have been awarded and executed. I gathered the contractors in my office, with President Harrison S. Robinson of the Governor's Financial Advisory Committee at my side, and told these contractors that we must have American materials, an American union standard of wages, citizens of the United States and voters and residents of California employed in the construction of this bridge.

The contracts were awarded to the lowest bidders, and no favoritism or political influences have been permitted by this department nor by the Governor to creep into this great bridge. Every person at work on this bridge and every firm receiving business therefrom has been selected for merit and by competition.

Work is soon to begin on this structure. Ground will be broken July 9th on Yerba Buena Island, according to our present calculations. The construction will require three and one-half years. An average of six thousand five hundred men will be employed for



THIRTY-SIX MILLION DOLLARS worth of construction business was given to five San Francisco contractors by State Director of Public Works, Earl Lee Kelly, when he handed to the low bidders the contract awards for building the major units of the San Francisco-Oakland Bay Bridge.

Left to right, front row, Henry J. Brunnier, Consulting Engineer, C. E. Andrew, Assistant to the Chief Engineer of the San Francisco-Oakland Bay Bridge, State Director of Public Works Earl Lee Kelly, Harrison S. Robinson, President of the Financial Advisory Committee of the bridge, George T. McCoy, Principal Assistant Engineer, Division of Highways.

Left to right, rear row, Edward J. Schneider, Columbia Steel Corporation, awarded two contracts, C. C. Horton, Healy-Tibbitts Construction Company, Henry J. Kaiser, Bridge Builders, Inc., Albert Huber, Clinton Construction Company, Allan McDonald, Transbay Construction Company, and C. C. Carleton, Chief of the Division of Contracts and Rights of Way.

that period. We estimate four hundred men will be given employment directly on the bridge during the first month of construction and that twelve thousand men will be at work on the bridge eighteen months later. Material dealers will give another five thousand men work manufacturing the products which will go into the bridge.

BUSINESS STIMULATED

So far-reaching is the effect upon business resulting from the construction of the San Francisco-Oakland Bay Bridge that no one person can calculate it. I have just learned that a Sacramento iron works has received a subcontract to build the miles of steel ladders required in the construction of the bridge. Most of the barges and floating equipment on San Francisco Bay will be called into use during construction, our office is informed by R. E. Fisher of the Bay Industries Committee. Already orders are being placed with the steel mills of Pittsburg and Torrence by the Columbia Steel Company and the Moore Shipbuilding Company for tons of steel.

The steel to be utilized in this bridge will constitute 6.7 per cent of the steel output of

the United States this year. The larger shapes—some of them five feet square, for the Cantilever section of the bridge—are already being forged in the eastern steel works.

Our ground-breaking exercises will be simple as we need not rely upon any pomp or ceremony to magnify the greatness of this world's largest bridge.

Not the least glorious fact about this unparalleled project is that no part of its financing comes out of the tax payers' pockets. It is financed solely out of its own revenue and the liens against its revenue only, so that the State of California and the taxpayers thereof can never be called upon to pay one cent of the cost of this world's greatest bridge. That fact, in times of taxpayers' distress, makes the San Francisco-Oakland Bay Bridge project a boon to California of so great a value that it can not be compared to anything in the history of this State.

Probably there never was a public project launched by any State under such propitious circumstances; with such exact engineering;

(Continued on page 21)

President Expected to Assist in Bay Bridge Ceremony

Midway between San Francisco and Oakland on verdant Yerba Buena Island, ground will be broken by spade, steam shovel, and dynamite on Sunday, July 9th, under the direction of Governor James Rolph, Jr., commemorating the start of construction of the San Francisco-Oakland Bay Bridge.

Director of Public Works Earl Lee Kelly has placed details of the ceremonies in the hands of the Alameda and San Francisco County Junior Chambers of Commerce. On the recommendation of the Junior Chambers, Governor Rolph was made honorary chairman, and the following vice chairmen were named:

Leland W. Cutler
Harrison S. Robinson
Jos. R. Knowland
H. Fleishhacker
J. Emmet Hayden
Earl Lee Kelly
George T. Cameron
A. B. C. Dohrmann
Robert G. Sproul
Arnold Mount
A. F. Hockenbeamer
C. H. Purcell
Clarence A. Lindner
Rear Admiral George W. Laws
Mayor Angelo J. Rossi, San Francisco
Dr. John L. Gresham, Oakland
Mayor E. N. Ament, Berkeley
Mayor Wm. F. Murray, Alameda
Senator Hiram W. Johnson
Senator Wm. G. McAdoo
Congressman Ralph Eltse
Congressman Albert E. Carter
Congressman Richard J. Welch
Congresswoman Florence Prag Kahn
William P. Carrington, Publisher Post-Enquirer.
W. N. Burkhardt, Editor San Francisco News
Robert P. Holiday, Publisher Call-Bulletin

PRESIDENT TO TALK

The program is expected to be started from Washington, D. C., when President Roosevelt or his representative touches a Postal Telegraph Company key in the White House which will set off three blasts—one in Oakland, one in San Francisco, and one on Yerba Buena Island, at the ends and in the middle of this world's largest bridge. Simple ceremonies have been planned but these significant actions and words will be broadcast by the National Broadcasting Company throughout the United States.

The only invited guests of honor are President Roosevelt and former President Herbert C. Hoover.

PLANS FOR BAY BRIDGE GROUND BREAKING

Place—Yerba Buena Island.

Date—Sunday, July 9th.

Speakers—

President Franklin D. Roosevelt.

Governor James Rolph, Jr.

President Roosevelt is expected to talk over the radio from Washington and press a button that will fire three blasts signalling beginning of construction.

Governor Rolph will turn the first spadeful of earth and act as chairman of the ceremonial exercises on Yerba Buena Island.

A salute of 21 guns will follow the President's greetings and a salute of 19 guns will follow Governor Rolph's address.

Governor Rolph, according to the preliminary plans, will make the principal speech of the program and his speech will be concluded by the new gubernatorial salute of 19 guns established by President Roosevelt at the Governor's request.

Should President Roosevelt speak over the radio to the assembled crowds on Yerba Buena Island it is planned to follow his speech with the Presidential salute of 21 guns, providing a search of official regulations indicates that rules will not be violated by firing a salute to a President present only in voice.

These and other major problems are being worked out by Director Kelly in conjunction with the Junior Chambers of the two bridge cities.

SHADE TREE PLANTING

With the idea of developing an ideal program of shade-tree planting along Coast Boulevard here, and arousing interest of neighboring communities in a similar plan, the Laguna Garden Club has adopted recommendations of the organization's shade-tree committee. Two proposed ordinances, one covering the planting and caring for shade trees, the other asking for a park and shade-tree commission, drawn up by Attorney Leslie F. Kimmell, will be presented to the city council. The program was accepted following a conference between Dr. W. L. Bigham of the Orange County Planning Commission and O. L. Halsell, also of the commission, and the Santa Ana Board of Forestry, and members of the shade-tree committee.—*Los Angeles Times*.

"Doctor, can't something be done about my husband talking in his sleep? It's all so indistinct!"—*Life*.



State of California

James Rolph, Jr. Governor

Resolution of the California Toll Bridge Authority

Whereas the Financial Advisory Committee to the San Francisco-Oakland Bay Bridge Division of the State Department of Public Works, appointed by me on the twentieth day of April 1932 has successfully negotiated the financing of the bridge across San Francisco Bay through the Reconstruction Finance Corporation; and

Whereas an unusual and difficult portion of these successful negotiations was conducted through the persons of the Executive Committee of this Financial Advisory Committee, to-wit,

Harrison S. Robinson... Herbert Fleishhacker...
George T. Cameron... Amadeo P. Giannini...
Leland W. Culler... R. M. Fitzgerald...
Joseph R. Knowland... E. Clarence Holmes...
and,

Whereas in so negotiating the financing of this history-making project they have rendered to the State of California

Distinguished Service

Wherefore, We **It Resolved**, that the State of California, through its duly appointed and authorized

California Toll Bridge Authority
hereby publicly commends and acknowledges its...
gratitude to the members of the Financial Advisory
Committee of the San Francisco-Oakland Bay...
Bridge Division of the Department of Public Works,
and especially to the Executive Committee thereof.

California Toll Bridge Authority

James Rolph, Jr.
Chairman.

Attest:

Carl Lee Keary
Secretary
California Toll Bridge Authority

Attest:

Frank L. Jordan
Secretary of State

City, County, U. S. and State Building San Gabriel Canyon Scenic Highway

By R. C. MYERS, Assistant Engineer, District VII

A SECTION of what is destined to become one of the most scenic mountain drives in Southern California is now under construction in San Gabriel Canyon from a point about three miles north of Azusa, near the mouth of the canyon to the junction of the west and north forks of the river, nine and one-fourth miles farther up the canyon. Although the construction is being done under a United States Bureau of Public Roads contract with C. S. Bruning, as resident engineer, the costs are being participated in by the State, the Los Angeles County Flood Control District and the city of Pasadena, as well as the U. S. Government.

The present project is part of a general plan for a sixty-five mile drive, known as the Angeles Crest Highway, leaving Foothill Boulevard at La Canada and extending up the Arroyo Seco to the divide between the Arroyo Seco and Big Tujunga watersheds, continuing northeasterly through the high mountains and passing through the City of Pasadena playground, Chilao and Buckhorn Flats, to connect with the proposed San Gabriel Canyon highway at the Los Angeles County Park at Crystal Lake; thence down this proposed route to again connect with Foothill Boulevard at Azusa.

THREE SECTIONS COMPLETED

The only portions of this highway which are built to requisite modern standards are the section eleven and three-fourths miles long from La Canada to Colby Canyon in the Arroyo Seco drainage, the section about twelve miles long in San Gabriel Canyon district from Azusa to the junction of the north and west forks of San Gabriel Canyon which is now being completed and a section of the highway extending up the north fork of the San Gabriel Canyon from the west fork to Coldbrook Camp, about five miles, which has been constructed by the Los Angeles County Road Department.

A narrow road with sharper curves and steeper grades has been constructed by the county and the United States Forest Service from Mount Wilson via Red Box, Barley Flat, and Chilao Flat to Buckhorn Flat a distance of about twenty-six miles.

The completion of this entire project will eventually open up and render accessible for recreational purposes the vast watersheds of the Arroyo Seco, San Gabriel and Big Tujunga, by far the largest mountain area which could be used for this purpose within easy driving distance of the metropolitan district of which Los Angeles is the center. All of this area lies within the Angeles National Forest.

BUILDING TWO DAMS

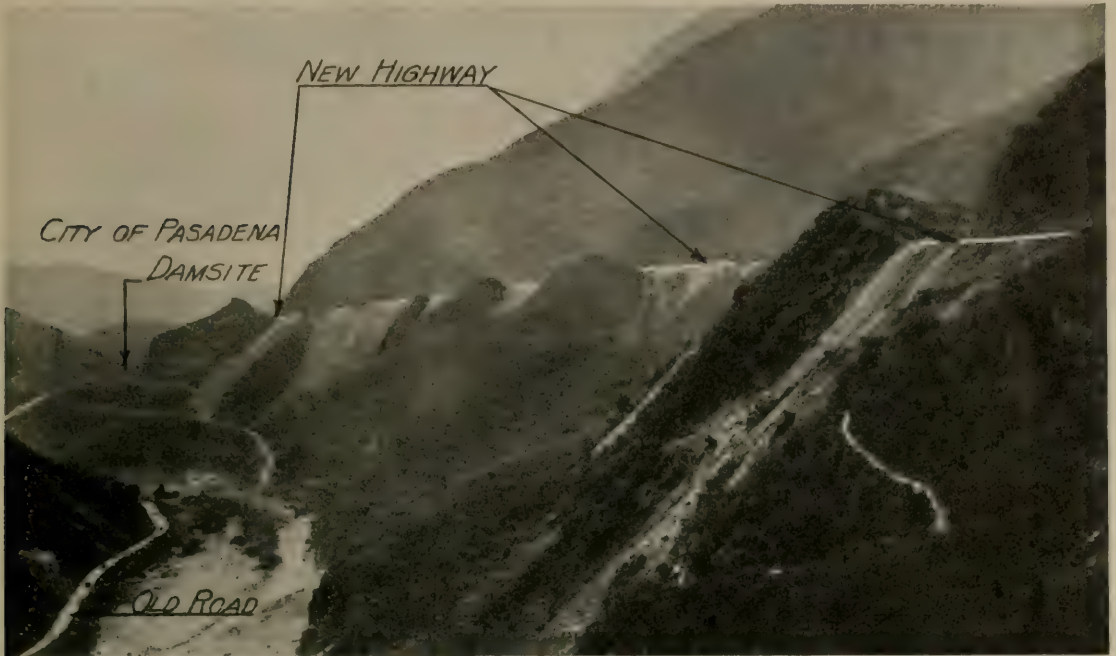
Construction of the nine and one-quarter mile section of the proposed route in San Gabriel Canyon is made necessary at this time by the construction of two dams in the canyon, one by the city of Pasadena and the other by the Los Angeles Flood Control District which will inundate the old canyon road, near the bottom of the canyon. By building these two dams with the consequent reservoirs and inundating the old road, the city of Pasadena and the Los Angeles Flood Control District were obligated to replace the old road with another road of equal standards above the high water line of their reservoirs.

As the State and the U. S. Government were both interested in constructing a highway up this canyon, the time seemed auspicious for a cooperative project among all the interested parties, viz: the U. S. Government, the State, the Los Angeles County Flood Control District and the City of Pasadena, to the end that a highway could be built on modern standards of alignment and grade above the high water of the two reservoirs as far up as the junction of the north and west forks of the river.

Under this plan of cooperation, the Los Angeles County Flood Control District and the city of Pasadena would contribute amounts equal to the cost of constructing a road of standards similar to those of the old canyon road. The U. S. Government and the State would add to this sum an amount necessary to construct the highway on modern standards of alignment and grade.

SHARING THE COSTS

Negotiations resulted in an agreement whereby the city of Pasadena and the Los Angeles County Flood Control District were



TAKING TO THE HILLS to avoid dams and lakes that will occupy the bottom of San Gabriel Canyon engineering forces are completing construction of new highline highway along steep mountain slopes of Angeles National Forest in cooperation with city, county and U. S. Government departments.



Map showing Angeles Crest Highway loop through national forest and San Gabriel Canyon.

each to contribute 40 per cent of the cost of the first seven miles. The U. S. Government and the State were each to pay ten per cent of the cost of this section. For the remaining two and one-fourth mile section to the river forks, the Los Angeles County Flood Control District was to pay 80 per

cent and the U. S. Government 20 per cent of the cost.

Preliminary surveys were started November, 1930, by field parties of the city of Pasadena and later continued by the Los Angeles County Flood Control District and the United States Bureau of Public Roads. Engineers

(Continued on page 18)

Pavement Records and Construction

Progress Made During 1931 and 1932

By **EARL WITHYCOMBE**, Assistant Construction Engineer

THE years 1931-32 were a period marked by economy and efficiency in the construction of high-type pavements, greater speed of production, and better riding qualities of the finished product. This was due to improved methods and technique of the engineers of the Division of Highways, modern equipment used by the contractors, and effective cooperation between engineers and contractors.

In this article will be described the records made in pavement production, strength of concrete, stability and density and asphalt mixtures, surface smoothness, and improvements in the design and construction of the various types of pavements.

Two experimental portland cement concrete pavements were constructed during 1931 and 1932. In 1931, one 0.6 mile project, located between Serra Point and South San Francisco, in San Mateo County, was so planned that a study could be made of the action of high early strength, low temperature, and standard cements.

RESEARCH PROJECTS

Two sections of 40' x 11'-9"-11" pavement were built, one 1,016' and the other 1,184' in length, divided into 17 separate subsections, and using six different brands and 17 different kinds of cement. An earth cushion varying from 2" to 18" thick was placed over the old macadam pavement, and watered, rolled and shaped. No reinforcing steel was placed, and no transverse joints other than a 2" expansion joint in each main section. Strain meters and temperature coils were placed in each section, this work being done under the direction of the Testing and Research Laboratory.

The second project was in Placer County, Newcastle to Wise Power House, and involved the use of wire mesh reinforcing in place of the standard $\frac{1}{2}$ " marginal bars. 2.3 miles of 20' and 0.4 mile 30' width, 9-7-9" thick was constructed with wire mesh reinforcing and expansion joints 40' apart, but with no dummy joints.

On this particular project, the cost of placing wire mesh was less than for placing marginal bars, but this was offset by the added

cost of mixer delays, traffic interference, etc., due to placing mesh. A second wire mesh project is now being constructed in Santa Clara County near Sunnyvale, which will be subject to much heavier traffic conditions than the Newcastle pavement.

Portland Cement Concrete Records

During 1931, the maximum average daily yardage of concrete, using one mixer, was placed on Contract 43CN3, in Colusa County between Williams and Maxwell, where the Union Paving Company, placed 467.3 cubic yards per 8-hour day; two machine finishers were used. E. J. Peterson was resident engineer, with A. C. Briney, assistant on the street. The maximum output for two mixers was on Contract 24TC7, in San Mateo County between Burlingame and San Mateo, where Basich Bros. placed an average of 853.4 cubic yards per day. W. A. Rise was resident engineer, with E. Carlstad on the street. Three machine finishers were used.

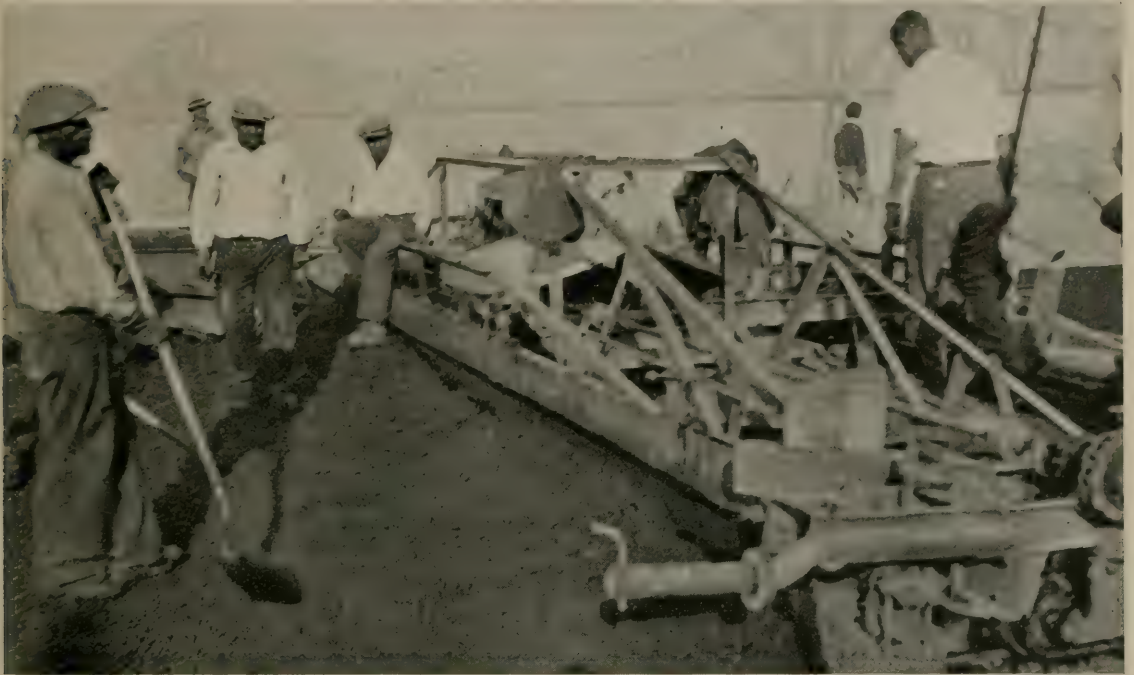
During 1932, the largest one-mixer output was on Contract 46CS1, between Tipton Crossing and Tulare, where the Union Paving Company averaged 467.9 cubic yards per day, using two finishers. W. T. Rhodes was resident engineer with P. A. Boulton on the street. For two mixers, the California record was broken on Contract 44TC2, Redwood City to Oregon Avenue in San Mateo, by Basich Bros., who placed an average of 880.7 cubic yards in eight hours, using two finishers. W. A. Rise was resident engineer, and F. W. Montell was street assistant.

STRENGTH RECORD

The strongest concrete placed during 1931 was on Contract 27FC15, at Galivan Crossing in Orange County, where an average breaking-strength of 6547 pounds was obtained. Griffith Company was the contractor, with W. J. Calvin, resident engineer. During 1932, the maximum average breaking strength of concrete was on Contract 47VC3, between Corona del Mar and Laguna Beach, also in Orange County, where 5708-pound concrete was placed by Jahn and Bressi under direction of W. D. Eaton, resident engineer.

New Methods Give Smoother Surface

(Continued from preceding page)



Thirty foot mechanical finisher on asphalt pavement in Contra Costa County.

The record for cement control during 1931 appears to be on Contract 45FC1, between Wigmore and Los Alamos, in Santa Barbara County, with an average daily variation of 0.25 per cent; Basich Bros., contractor, and E. W. Taylor, resident engineer. During 1932, another District V contract, 45CS2, had the best cement control with 0.18 per cent variation, this being in Santa Barbara County between 2 miles north of Solomon Summit and 1½ miles south of Santa Maria; Fredrickson and Watson, contractors, and J. C. Adams, resident engineer.

The record for surface smoothness in 1931 was made on Contract 27VC11, La Posta Creek to Campo Road Junction, San Diego County, with a roughness of 6.6 inches per mile; contractor, E. Paul Ford; resident engineer, C. P. Montgomery. During 1932, the smoothest surface, 5.8 inches per mile, was obtained on Contract 47VC9, Rose Canyon to Sorrento Creek, also in San Diego County; B. G. Carroll, contractor; R. J. Hatfield, resident engineer.

Asphalt Concrete Records

The 1931 record for tonnage production was made on Contract 25FC6-25EC3 by the Peninsula Paving Co. in San Luis Obispo County, between Paso Robles and northerly boundary, where the average daily output was 1117.3 tons. T. W. Voss was resident engineer and J. M. Chaffee, street assistant. Contract 26FC2 in Fresno County, Goshen to Kingsburg, Union Paving Company,

was a close second, with 1025.3 tons average output. H. B. La Forge was resident engineer, L. J. Low, street assistant.

In 1932, the California record for asphalt pavement production was made on Contract 46CN1, in Fresno County, between Fancher Creek and Fresno, Union Paving Company, contractor, where 1317.7 tons were averaged per eight-hour day. H. B. La Forge was resident engineer, with L. J. Low, street assistant.

Stability of asphalt mixtures was emphasized during 1931, the record being made on Contract 48CS1, in Imperial County, East Highline Canal to Sand Hills, Griffith Company, contractor, with E. A. Wolfe, resident engineer. The average stability was 3993 pounds for surface mixture. During 1932, maximum surface stability of 3152 pounds was obtained on Contract 47VC5, at Fullerton in Orange County; Oswald Bros., contractor, and R. D. Kinsey, resident engineer.

The maximum density of asphalt mixture during 1931 was 97 per cent on Contract 28FC5, in Imperial County, Arroyo Salada to northerly boundary, R. E. Hazard Co., contractor, with H. O. Ragan, resident engineer. The 1932 density record was 97.5% on Contract 47VC4, at Glendora; Oswald Bros., contractor, L. R. McNeeley, resident engineer.

SMOOTHNESS RECORD

The record for smoothness during 1931 was made on Contract 26FC2, Goshen to Kingsburg, Fresno County, where 11.5 inches per mile was ob-

Paving Joint Construction Improved

(Continued from page 11)

tained; Union Paving Company, contractor; H. B. La Forge, resident engineer. During 1932, two projects made approximately equivalent smoothness records. Contract 46CN1, Fancher Creek to Fresno, Fresno County, registered 10.3 inches per mile, Union Paving Co., contractor, and H. B. La Forge, resident engineer; Contract 47VC5, at Fullerton, Orange County, had 10.5 inches per mile; Oswald Bros., contractor; R. D. Kinsey, resident engineer.

Summary of Pavement Design and Construction

PORTLAND CEMENT CONCRETE

During the year 1931, concrete pavement projects had an average output per day of 359.5 cubic yards, with an average compressive strength of 4961 pounds. Cement control was good, the average variation from standard 6-sack batches being but 0.65%. The average surface smoothness of concrete pavements was 10.5 inches per mile.

In general, one 27E paver was used on each project for concrete mixing; on two contracts, 43TC1 and 24TC7, Basich Bros. used two pavers each. A truck mixer was used on contract 24EC10, 0.1 mile at Colma. On 10 jobs, two machine finishers were used, on 14 jobs, one finisher was used, on one job, 3 finishers were used, and on 2 small jobs of 0.1 mile and 0.2 mile, spreading and finishing was done by hand.

On Contract 43CN3, one mixer averaged 467.3 cubic yards of concrete per eight-hour day for 45 days, operating at 97% efficiency. On Contract 24TC7, two mixers averaged 853.4 cubic yards per eight-hour day for 22 days, operating at 90% efficiency, establishing a record for two mixers. This was a 40' x 11-9-11" pavement laid in two 20' strips with a longitudinal weakened plane in each strip. Expansion joints were placed 30' apart with 1" dowels; $\frac{5}{8}$ " reinforcing bars were placed around each 10' x 30' panel. Two 20' machine finishers were used.

IMPROVEMENTS ADOPTED

Joint Construction has been improved by the introduction of various devices. End sockets of galvanized metal were used to prevent concrete from running around ends of filler; cast iron frogs were designed to clamp on to side forms to prevent finisher from pushing over the joint filler. A steel channel section was adopted to slip over the joint filler, extending 1½" into slab to form a true finishing line. On Contract 43TC1, an experimental dummy joint was designed to give a smoother joint finish. The joint was made with a steel plate which was removed after the heavy floating and replaced with a strip of 16-gauge sheet metal anchored on the lower edge. This results in a uniform crack after finishing surface.

Finishing practice was also improved during 1931. The heavy longitudinal float followed the machine finisher, and subsequent floating was done with one-man 8-10' ribbed floats. In dry localities, fogging was used to keep slab moist during finishing operations, resulting in a better surface,

with little hair checking. By the fogging method, the slab is kept moist while uncovered, and after finishing is completed, it is covered with burlap and kept wet until ponded or covered with an earth blanket.

1932 Construction

During 1932, the average daily concrete pavement output was 420.8 cubic yards, with an average compressive strength of 4665 pounds. Cement control averaged 0.71 per cent, about the same as in 1931. The average surface smoothness was 9.0 inches per mile, an improvement over 1931.

Two pavers were used on four contracts, two of which were 10' construction, while on 16 contracts two finishing machines were used. On Contract 44TC2, 7.5 miles of Bayshore highway south of Redwood City, the average for 44 eight-hour days was 880.7 cubic yards. This exceeded the 1931 record made by the same contractor, Basich Bros., by 27.3 cubic yards, a new high record output. Based on 480 cubic yards capacity for these pavers, an efficiency of about 92 per cent was attained. This pavement was also 40'x11-9-11".

HIGH OUTPUT RECORD

On Contract 46CS1, the Union Paving Company again made the high record for output from one paver, when an average of 469.7 cubic yards per eight-hour day was made for a period of 39 days, an operating efficiency of about 98 per cent on this paver.

Joint Construction—The 20' interval of designed joints remained standard with few variations. Several deviations were made in experimental sections within contracts, one of which was to eliminate designed joints entirely. Sufficient time has not elapsed to form any definite conclusions. Several projects were constructed with 20' interval on contraction joints and 400' interval on expansion joints.

Difficulty has been experienced in the past with localized heaving at designed joints over adverse soils due to water penetrating the subgrade through the joints. Considerable experimenting is under way to develop a satisfactory method of sealing, and more attention is being paid to selection and treatment of subgrade materials than in the past.

Finishing has been improved by lengthening the one-man floats from 10 to 16 feet.

NEW METHOD DEvised

New methods of finishing are continually being tried and as improvement is made the practice becomes standardized. For example, on Contract 43CN3, Williams to Maxwell, the roughness averaged 13.7 inches per mile. The same contractor had an adjoining contract, 43EC3, Maxwell to 4 miles southerly, and paving was started immediately following the completion of 43CN3.

On the second project the resident engineer made a deviation in joint construction in an endeavor to improve the riding qualities. The joint finishing tool was mounted on a float board to prevent cutting below the general surface of the

Mixtures Controlled by Stability Tests

(Continued from preceding page)



Two mixers in operation in San Mateo County, laying cement concrete pavement.

pavement, and the final finish float was used behind the edging of joints to true up any irregularities. The second project averaged 7.3 inches per mile in surface roughness, or a decrease of 6.4 inches per mile.

Asphalt Concrete Pavement

1931 CONSTRUCTION

During 1931, the average daily output of asphalt concrete mixtures was 624.9 tons, while two projects, Contracts 26FC2 in Fresno County and 25FC6-25EC3 in San Luis Obispo County, averaged 1025.3 tons and 1117.3 tons respectively per eight-hour day. On four projects, two mechanical finishers were used, one for finishing surface and one on base. The average stability of surface mixtures was 3323 pounds, and the average relative specific gravity or density was 93.8 per cent. The average surface smoothness of asphalt pavements was 17.5 inches per mile.

In designing asphalt concrete mixtures, the Hubbard-Field stability test, applied to the mortar portion of mixtures to determine the resistance to displacement, continued to control, and surface mixes with dust contents of 22-25 per cent of the total mixture passing the 10-mesh sieve were used. It has been found that this mixture is less susceptible to pushing and rolling under present-day traffic conditions, and also retains its nonskid qualities for a longer period of time.

Automatic Proportioners — Production plants have been made more efficient by improved meth-

ods of feeding, greater storage capacity of heated aggregate, quicker discharge gates, and automatic timing devices. On one project, the proportioning device, which was operated by hydraulic jacks powered by electric motors, opens one gate and holds it open until the set weight is deposited in the weight box, then closes the first gate and opens the second gate in predetermined order. Four separate mixes may be set up at one time, and mixes can be changed by means of a selective switch. An average output of 970 tons per day for 44 days, with $2\frac{1}{2}$ -ton batches, was turned out with this plant, operated by Hanrahan Company in San Luis Obispo County.

Spreader boxes were in general use to distribute the truck loads of mixture, and mechanical finishers with various improvements which have been made since their inception in 1927. The rake design was improved by changing the motion to a direct fore and aft movement which gives a combing action to the mix. A traveling track arrangement was used by the Hazard Company on Contract 28FC5 in Imperial County, which eliminates the necessity of carrying track ahead.

A caterpillar tread has been used on finishers, spreading outside the side forms, with the screeds riding on the forms. Greater surface smoothness is being obtained by initial cross-rolling with tandem roller instead of diagonal or half-circle rolling, this method covering the entire surface better, the roller turning being done off pavement. The resulting smoothness approximates that of portland cement surfaces.

(Continued on page 22)

Frost Bitten Trees Along the Roadsides Show Signs of Life

By H. DANA BOWERS, Landscape Engineer

THE effect of the week of cold weather from December 9 to 15, 1932, is very noticeable in traveling the highways, as the roadside trees, particularly the eucalyptus, suffered severe damage. According to the Weather Bureau the temperature was the lowest of record since 1888, when 19° F. was recorded in Sacramento. A temperature of 18° was recorded in 1854. During the past winter the thermometer dropped to 17° at Sacramento, 11° at Chico, 6° below at Yreka, 13° at Ukiah and 25° at Bakersfield.

Generally speaking, very little severe frost damage is noted south of the Fresno County line in the San Joaquin Valley, and south of the Santa Clara Valley in the coastal region. While the temperature was not as low along the coast at Eureka as in valley sections, the damage was as great, as the trees were not acclimated to such low temperatures.

COAST SUFFERED LITTLE

With the exception of the Eureka region, where the frost kill was severe, the entire coastal region suffered very little, the leaves and small growth only being destroyed. The most damage was noted on the eucalyptus globulus (blue gum), which has been generally considered a very hardy variety.

In the Sacramento-San Joaquin valleys, the frost kill on eucalyptus trees might be estimated at 33½ per cent at this time. A few were killed completely, but the major portion were about one-third destroyed.

The fact that many of the trees which were apparently killed are putting forth new growth is surprising. A careful inspection early in the spring showed that the bark had turned black and that the sap had coagulated like jelly near the cambium layer. Such severe damage would unquestionably have killed the other plant species. The rule does not seem to apply to the eucalyptus and it still remains to be seen just what will occur ultimately as much of the new spring growth is now dying.

BEAUTIFUL VARIETIES

The most beautiful varieties of eucalyptus, such as eucalyptus ficifolia (scarlet flowering gum), eucalyptus sideroxylon rosea (pink iron bark) and eucalyptus corynocalyx

287,859,000 MAN-HOURS OF LABOR THROUGH R. F. C. LOANS

The 103 self-liquidating loans totaling \$200,187,250 and authorized by the Reconstruction Finance Corporation up to May 1 are scattered generally throughout the United States, thereby relieving many local unemployment problems. However, Director Harvey Couch, sponsor for self-liquidating loans, reports that several States have not yet availed themselves of the opportunity offered to acquire permanent improvements and at the same time put men to work.

So far, loans have been made in 32 States and 1 Territory. Texas leads, with 12 in number, California has 5, and Utah 4. California has negotiated the largest amount of loans to date for an extensive program of bridges, aqueducts, and transmission lines, New York being second.

The 103 loans are estimated to provide 287,859,000 man-hours of direct and indirect labor. Most of the smaller loans are for water supply systems totaling \$58,038,250. Fifty-nine cities and towns have arranged to build permanent water works, thus improving sanitary conditions, safeguarding public health, and relieving unemployment through federal aid. The loans include seven bridge projects totaling \$83,100,000.—*Western Construction News.*

SHORT BRIDGES ELIMINATE 31 DANGEROUS ROAD DIPS

Completion of the improvement of State Highway Route 26 through Coachella Valley, between Whitewater and Indio, was celebrated with an extensive program of ceremonies on Sunday, April 2d.

The improvement involved the widening of some fourteen and a half miles of highway from fifteen to twenty feet, and the elimination of thirty-one dangerous dips by building short bridges, at a total cost of \$587,000.

The Highway Commission was represented by Commissioner Frank A. Tetley of Riverside, who was one of the principal speakers. The festivities included a barbecue and selections by the Sherman Indian Band of Riverside.

(sugar gum) are planted extensively in southern California, but are seen very little in the north because of their susceptibility to frost injury.

Some of the common varieties which seem adaptable to the average conditions found in the Sacramento and San Joaquin valleys are as follows:

- Eucalyptus leucoxylon (Victorian iron bark)
- Eucalyptus polyanthema (red box)
- Eucalyptus rostrata (red gum)
- Eucalyptus rudis (desert gum)
- Eucalyptus viminalis (manna gum)

The eucalyptus trees have been planted so extensively in California that many people consider them as native trees.

Work Advanced to Bids in May

The following improvements carrying an aggregate total cost of approximately \$525,000 were scheduled for advertising prior to June 1. The work includes four paving jobs, a bridge reconstruction and a subway under a railroad, with six counties sharing in the benefits of the improvements.

DETAILED LIST OF PROJECTS

County	Location	Route	Miles	Type
Tulare	Goshen to Plaza Garage	Los Angeles-Sacramento Arterial	4.2	Permanent Pavement
Los Angeles	At Brea Canyon Summit	Pomona-Fullerton Road	1.3	Permanent Pavement
San Bernardino	At Mt. Vernon Avenue Viaduct	Foothill Boulevard	0.7	Permanent Pavement
Los Angeles	Las Flores Canyon to Winter Canyon	Oxnard-Serra Highway	3.4	Permanent Pavement
San Joaquin-Stanislaus	Across Stanislaus River near Manteca	Los Angeles-Sacramento Arterial	---	Reconstructing Bridge
Kern	Four miles north of Bakersfield	Los Angeles-Sacramento Arterial	---	Minkler Spur Subway

SUMMARY

Type	Miles	Amount
Permanent Pavement	9.6	\$397,700
Bridges	(2)	127,300
Total		\$525,000

Spraying and Burning of Roadsides in 40 Counties Completed

THE annual program of spraying roadside vegetation to reduce the fire hazard to property adjacent to heavily traveled routes has been practically completed. This work was carried on in some forty counties of the State, and covered nearly 1800 roadside miles. Seven contracts were let for furnishing and spreading the oil.

Under the plan as adopted several years ago by a committee appointed by the Governor, a fire break nine feet in width is created adjacent the highway fence lines by spraying the vegetation, while still green, with diesel oil. The oil kills the vegetation, which is then

burned before adjoining areas dry up and create a hazard.

The diesel oil used is a 27° to 30° gravity. It is applied by power distributors equipped with an adjustable outrigger arm of sufficient length to reach out to the area to be sprayed and designed so that the spray bar may be readily raised or lowered to reach cut or fill slopes. About one-tenth gallon of the oil is applied in general to each square yard of surface, although where the work can be done when the vegetation is about two inches in height an application of one-twentieth gallon is effective on certain areas.

The work is confined to areas opposite grain or pasture land and forested sections. In general no work is done adjacent railroad rights of way, where orchards are alongside or similar locations where the hazard is limited by the natural conditions.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

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SAFE HIGHWAYS

Highway engineers, generally, now recognize that safety must be built into the highway and large sums are being expended to make new roads safe and to take the danger spots out of old ones. This is illustrated by the construction of the Ridge Route Alternate on the California State highway, to take fast-moving traffic off the old Ridge Route, where sharp curves and steep grades have taken an alarming toll in casualties. Millions of dollars are involved in this project, but it will be a good investment for the public. Large sums are also being spent to build safety into the Roosevelt State highway north of Santa Monica, where it skirts the hills at the edge of the sea. This has become in the short time since it was first constructed one of the most heavily traveled sections of the entire State highway system. Menace of slides in deep cuts and narrow roadways and dangerous curves is now being removed.

However, the building of safety into highways today in California is not so much of a problem as was the building of the original roads in the State highway system. Many of the existing hazards which are now being gradually removed were the result of inadequate financing in the earlier period. Stretching bond issues into miles, while it met the exigencies of a situation, merely shifted the burden of building adequate highways to a later period. Happily the motorist, with a growing appreciation of hard surfaced and safe roads, assumed the major part of the burden of reconstructing the original State highways at a critical time, and his generosity has been rewarded up to this time by rapid improvement of the State highway system. The gasoline tax has yielded revenues sufficient for betterments.—*Southwest Builder and Contractor.*

Big Barbecue Marks Official Opening of San Julian Cut-off

BETWEEN six and seven thousand persons participated in the gala official opening ceremonies of the San Julian Cut-off near Lompoc on Sunday, May 28th. The event was attended by members of the California Highway Commission and other State, county and city officials.

The formal exercises began at 10.30 a.m. on the new cut-off near Jaro bridge when Chairman Harry A. Hopkins of the Highway Commission, armed with a huge pair of golden shears, held by a petite miss to cut a floral chain held by eight beautiful Lompoc maidens.

A monster barbecue followed in Miguelito Park, at which seventeen beeves were served to nearly five thousand people.

After the fete a program of speeches and music was conducted by Supervisor Ronald N. Adam, general chairman for the celebration. Speakers included Mayor F. T. Gunderson of Lompoc; Supervisor John R. Quinn of Los Angeles County; Supervisors C. L. Preisker, Sam J. Stanwood and Fred G. Stevens of Santa Barbara County, Senator Edgar W. Stow and Assemblyman George R. Bliss.

Among others who participated in the exercises were Highway Commissioners Philip A. Stanton, Timothy A. Reardon, and Dr. W. W. Barham; Mayor Harvey T. Neilson of Santa Barbara and Secretary W. G. Herron of the Santa Barbara Chamber of Commerce.

The new cut-off road leaves State highway route No. 2 at Las Cruces and extends northwesterly 18 miles to Lompoc. It was built by the county on modern highway standards and is included in the 6700 miles of county roads taken into the State system when Governor Rolph, on June 6th, signed Assembly Bill No. 583.

DATES BACK TO PHARAOHS

"The principle of public works for the relief of unemployment is as old as the hills," states John P. Hogan, chairman of the Public Works Committee of the American Society of Civil Engineers. "When the Pharaohs had completed their conquests and had large numbers of unemployed soldiers and slaves, they built the Pyramids, as well as roads and irrigation canals through the conquered territory.

"When the peace of Amiens brought a lull in the wars following the French Revolution, Napoleon built the magnificent road system of France.

Cooperative Projects Total \$1,941,352

(Continued from page 2)

4. The municipality must control and maintain the completed project.

5. The State will grade and pave or improve the road to a standard equal to that on the immediately adjacent State highway, of which the cooperative project is an extension or a connecting link.

IMPORTANT BUDGET ITEM

The Highway Commission welcomes proposals from local authorities and although such applications now on file are in excess of available funds, the State feels that this phase of improvement to the State highway system is a vital factor in obtaining continuity in the road network and that increasing consideration must be given to this work in preparing future budgets.

A list of cities which have availed themselves of this opportunity of securing State aid for the improvement of connecting routings shows that State cooperation is extended on the basis of the need and the ability of the local community to advance its portion of the obligation, irrespective of the size or class of the municipality. In the following cities cooperative projects for the current biennium have been completed or are now under construction:

Napa	Huntington Beach
Lodi	Los Angeles County
Oakdale	Laguna Beach
Santa Clara	Glendora
Redwood City	Fullerton
Fresno	Holtville
Kingsburg	Ventura
Willows	San Diego
Yuba City	Brawley
Red Bluff	Redondo Beach
Placerville	Bakersfield
Sausalito	

IMPROVEMENTS PLANNED

Proceedings have been instituted and plans are now in preparation for undertaking possible cooperative improvements during this biennium in the following cities:

Modesto	Pasadena
Willits	Anaheim
Fresno	Santa Barbara
Sonora	El Cajon
Santa Cruz	San Diego
El Segundo	Long Beach

The following summary provides a definite idea of the extent of cooperative construction completed and put under way in California during the past two years:

Type	Miles (State's share)	Amount
Permanent pavement	30.5	\$1,349,317 70
Bituminous treated crushed rock surfacing	0.4	41,705 45
Graded roadbed	4.4	72,687 78
Bridges	(9)	477,641 49
Totals	35.3	\$1,941,352 42

The individual projects vary greatly in size: the amounts of State participation ranging from \$1,300 to \$237,000; roadbed widths varying from 36 feet to 100 feet and pavement ranging from 20 feet to 76 feet in width. The following brief descriptions of a few representative cooperative projects will provide a conception of the methods of State cooperation.

BRIDGE FOR NAPA

In the city of Napa a reinforced concrete girder bridge was constructed across the Napa River on Third Street, where the route of State Highway No. 8 passes through the city. In sharing the cost of the construction of this bridge the State provided a flat sum of \$25,000, which was approximately one-third of the cost, the city of Napa and Napa County divided the remaining two-thirds of the cost equally. The bridge was built by contract under the supervision of the city, and the State approved the plans and kept an inspector on the construction.

The routing of the State highway through Santa Clara was changed from Franklin Street, the main business artery of the town, to an alignment along Clay and Grant Avenues and The Alameda, through residential and industrial sections. This improvement involved the construction of pavement 40 feet, 56 feet and 76 feet wide between curbs. The work was performed by a city contract with the approval of the Division of Highways. The State paid for the central 40 feet of paving and all other costs were borne by Santa Clara.

SUPERHIGHWAY BUILT

In the town of Oakdale in Stanislaus County a twenty-foot pavement was placed. In this instance the town provided the right of way

(Continued on page 31)

\$1,152,000 Project Employing 550 Men

(Continued from page 9)

of the U. S. Bureau of Public Roads made the final location from the data obtained by the various field parties. The section from Azusa to the river forks was adopted as a State highway layout June 2, 1932, in order that the State could contribute to the cost.

The project leaves the old canyon road at a point about three miles northerly of Azusa, crossing the river on a new bridge and ascends along the west side of the canyon. There was little choice of location for the first one and one-half miles, as it was necessary to climb on maximum grade to attain an elevation higher than the high water of the city of Pasadena reservoir at a point opposite the dam which is now under construction.

From a point opposite the dam site an undulating grade to fit the topography of the country, follows around the west side of the reservoir site. From the upper end of this reservoir site the grade gradually ascends to an elevation above the Los Angeles County Flood Control District reservoir high water contour. From here a rolling grade, varied to fit the topography of the country, continues to the mouth of the north fork of San Gabriel River, the end of the project.

UNDER THREE CONTRACTS

The highway was designed on standards similar to those used on the portion of this general highway project in the Arroyo Seco Drainage area, the maximum grade being 6 per cent and the minimum radius of curvature 200' in general and 300' on blind curves. The roadbed is 28' wide on fills and 30' wide in cuts. Embankments are placed in layers and watered and rolled to secure maximum compaction.

Work was let under three contracts—One being for construction of the bridge across San Gabriel River at the beginning of the project, and the other two being grading contracts for the first seven miles and the next two and one-fourth miles respectively. Bids for the first grading contract were opened June, 1932, and for the second grading contract, January, 1933. Work under the bridge contract was started November, 1932, and completed April, 1933. The cost of the first grading contract is now estimated to be \$950,000—that of the second grading contract \$150,000, and the cost of the bridge \$52,000, or a total of \$1,152,000 for the entire project.

These two grading contracts are providing employment for from five hundred to five hundred and fifty men. In accordance with the policy of the U. S. Government, preference in employment is given veterans with dependents so that several times this number of people are benefited by the employment afforded by the project.

Judging from progress made to date, the first grading contract will be completed by July 1, 1933, and the second one about one month later. A light "road-mix" oil surfacing will be applied under a State contract immediately after grading work is completed so that this entire section to the north fork of the river should be in use by the middle of the summer.

BIG EXCAVATING JOB

Probably the most unusual construction feature is the immense amount of excavation required. The two grading contracts involve the excavation of 1,800,000 cubic yards of material or about 200,000 cubic yards per mile as an average for the job. Most of this material is granite in various stages of disintegration. Fortunately, a large percentage is soft enough to be removed by tractors and scrapers without blasting. As most of the grading work is side-hill excavation involving comparatively short hauls this is a very economical method of hauling the material. On the portions where longer hauls are required, power shovels and trucks are used.

One very unusual feature is a 300,000 cubic yard embankment constructed across Brown's Gulch, one of the side canyons which comes into the San Gabriel a short distance below the Los Angeles County Flood Control District's damsite. The construction of this enormous fill rather than locating the road to cross near the head of the gulch, saves more than a mile of distance. Its inclusion in the design is economical because it provides a convenient disposal for a large amount of surplus excavated material which would otherwise be wasted.

The height of the fill on the center line is 165 feet, but the canyon which it crosses slopes on such a steep pitch that the height above the toe of slope on the lower side is considerably more than this. This canyon is an "S"

(Continued on page 23)



With all danger of floods having passed for this season and the completion of snow survey and precipitation reports the monthly report of State Engineer Edward Hyatt states it is estimated that the seasonal run-off for the combined Sacramento-San Joaquin drainage area will be 45 per cent of normal resulting in a low seasonal and summer stream flow.

As the result of these conditions, the report states, preliminary information indicates that the 1933 rice acreage will be approximately 20 per cent less than in 1932 and maximum salinity figures are anticipated at Bay and Delta stations. The water content of the season's snow pack, according to final reports, averaged only 75 per cent of last year's pack.

Details of dam construction, water distribution, flood control and irrigation district activities and the State water plan are given in the report which follows:

IRRIGATION DISTRICTS

Office work was continued in checking and assembling information furnished the State Engineer in annual reports of irrigation districts, some sixty-five of which have been received to date. Requests for information on irrigation districts and irrigation district matters in general showed increased activity during the month.

The Nevada Irrigation District contemplates an agreement with the Pacific Gas & Electric Company whereby the district will acquire the certain rights and property now used by the power company for the service of irrigation district lands in Placer County, thus placing the service of all district lands directly under the authority and responsibility of the district.

A petition was received by the State Engineer from the owners of 1711 acres in the Tulare Lake Basin Water Storage District requesting that action be taken for the exclusion of their lands from the district.

The office of the El Dorado Irrigation District was visited in connection with matters to be submitted to the Districts Securities Commission concerning the approval by the Commission of the transfer of certain funds.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Routine maintenance only by our regular crew has been performed during this period, in connection with levees, structures, pumping plants, drains and repairs to equipment. The crew has continued to work on part time and, as there have been no heavy storms and practically no water in the by-passes, no emergency work has been necessary.

The regular crew has been engaged to some extent in putting equipment and property in order and maintaining the floating river equipment and warehouses. Work has commenced on a minor repair to the east abutment of weir No. 2, in the East Sutter by-pass levee borrow pit.

Emergency Flood Protection and Rectification of Rivers.

The camp operated by this division near Lompoc, in cooperation with Santa Barbara County, has continued with a crew of approximately 30 men. This is an unemployment relief project, and the men are engaged in clearing the flood channel of the Santa Ynez River. Only unemployed, single residents of Santa Barbara County are being cared for, and the camp will probably operate at least three months longer.

Russian River Jetty.

All work on the Russian River jetty was terminated on March 24th on account of lack of funds. All tools, materials and equipment were moved to our Sutter warehouse, with the exception of the shovel, derrick, cars and locomotives, but the parts of these which might be stolen were also removed. Any or all of this equipment can be returned to the job promptly if required.

Flood Measurements and Gages.

The operation of all gages and the collection of data has continued, but there has been no occasion to make flood flow measurements on account of lack of storms. At this time it appears that all danger of floods for this season has passed. There are now available for distribution in mimeographed form flood season data reports for the following periods: 1913-14 to 1924-25; 1926-27; 1928-29 to 1930-31; and 1931-32. A reissue of the report for 1925-26 is now in preparation. The above completes the series containing all flood data of the Sacramento and San Joaquin valleys not otherwise available in printed form, from 1913 to date.

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Stream Flows 30 to 60 Per Cent Below Normal Forecasted for Season

By HARLOWE M. STAFFORD, Supervising Hydraulic Engineer, Division of Water Resources

THE season's most important snow surveys as respecting predictions for spring and summer water supply were completed in late March and early April and the data therefrom, together with records of seasonal precipitation to April 1st were analyzed to derive the estimates of 1933 stream flow. These were published in the April 1st Snow Survey Bulletin of the Division.

This is the fourth season in which, under State supervision and through cooperation of many interested agencies, surveys have been conducted at some 160 snow courses throughout the Sierra at altitudes from 4600 to 11,400 feet and from Upper Sacramento and Pit River basins on the north to Kern River basin on the south.

LOW WATER CONTENT

In general, this season's snow pack as measured in inches of water content averaged from 60 to 90 per cent of last year's pack, with a general average of about 75 per cent. A marked exception was shown by three snow courses in the Upper Sacramento basin, Mt. Shasta, Mt. Lassen and Snow Mountain, which averaged 10 per cent greater pack than in 1932. Owens and Mono Basin courses averaged from 40 to 55 per cent of last year's pack.

For the areas where the snow surveys have been conducted for a sufficient number of years to permit the development of tentative normals, the Western Sierra slope pack varied from about normal to 35 per cent below normal with a general average of about 20 per cent below normal. Eastern slope basins averaged from 25 to 50 per cent below normal.

PRECIPITATION BELOW NORMAL

The data from the precipitation stations indicated, in general, that this season's precipitation to April 1st averaged 30 per cent below normal in Upper Sacramento Basin, 40 to 50 per cent below normal from Feather to Mokelumne basins, 25 to 35 per cent below from Stanislaus to Upper San Joaquin basins, 10 to 20 per cent below from Kings to Kern basins, and 30 to 40 per cent below

in San Gabriel, Santa Ana and Los Angeles basins. Eastern slope basins averaged 35 to 40 per cent below normal from Truckee to Walker, 50 per cent below in Mono, and 20 to 35 per cent below in Owens.

Except for South Yuba and Bowman area drainages and for Eastern Slope basins, Truckee, Tahoe, Carson and Walker, the period of record of the snow surveys has been too short to permit an entirely dependable establishment of the correlation between snow and run-off. Tentative "normals" have, however, been worked out for all snow courses by comparison with long-time stream flow records and on the basis of these, the results of this season's surveys were applied to venture forecasts of the 1933 snow run-off as represented by the stream flow during the period April to July, inclusive.

FORECASTS TABULATED

These forecasts which, because of the shortness of the basic correlation period, must be taken more as a provisional guide than a definite prediction, are shown in the accompanying tabulation. The present number and distribution of the snow courses does not permit of these provisional forecasts for all major stream basins in their entirety. The table shows also a comparison of the similar provisional forecasts which were made on April 1st a year ago and the corresponding actual April-July run-off in 1932.

Based upon all available precipitation and snow data, estimates were also made on April 1st of the 1932-33 seasonal stream flow (October, 1932, to September, 1933, inclusive) in the major stream basins. Expressed in per cent of the mean seasonal flow for the 40-year period 1889-1929 the 1932-33 estimates varied from 30 to 50 per cent of the mean for the basins of the Sacramento and San Joaquin Rivers to 55 or 60 per cent in the Kings, Kaweah, and Kern River basins.

FORTY-FIVE PER CENT STREAM FLOW

For the combined Sacramento and San Joaquin Rivers and tributaries the 1932-33

Forecast of Seasonal Stream Flow

April-July (Inc.) stream flow acre-feet¹

Drainage area or stream gaging station	1932			Per cent departure of forecast
	1933 forecast	Forecast	Actual	
South Fork Pit River near Likely.....	32,400	42,500	44,500	-4
Pit River at Ydaltom.....	931,000	916,000	865,000	+6
North Fork Feather River near Plattville.....	268,000	300,000	233,000	+29
Bowman Area-Middle Yuba and Canyon Creek.....	100,000	124,000	127,000	-2
South Fork Yuba River at Langs Crossing.....	240,000	293,000	308,000	-5
North Fork American River at Colfax.....	293,000	350,000	311,000	+12
American River at Fair Oaks.....	1,270,000	1,700,000	1,580,000	+8
North Fork Mokelumne River near West Point.....	328,000	500,000	512,000	-2
Mokelumne River near Clements.....	390,000	588,000	564,000	+4
Middle Fork Stanislaus River near Avery.....	273,000	494,000	458,000	+8
Stanislaus River near Knights Ferry.....	640,000	1,000,000	972,000	+3
Tuolumne River near Hetch Hetchy.....	471,000	798,000	740,000	+8
Tuolumne River at Jacksonville.....	1,120,000	1,600,000	1,500,000	+6
Merced River at Pohono Bridge.....	322,000	390,000	447,000	-13
Merced River at Exchequer.....	496,000	690,000	725,000	-5
San Joaquin River above Big Creek.....	764,000	1,400,000	1,270,000	+10
San Joaquin River near Friant.....	920,000	1,600,000	1,520,000	+5
Dinkey Creek at mouth.....	90,400	150,000	155,000	-3
North Fork Kings River above mouth.....	348,000	506,000	514,000	-2
Kings River near Hume.....	696,000	1,000,000	929,000	+8
Kings River at Piedra.....	1,050,000	1,600,000	1,580,000	+1
Kaweah River near Three Rivers.....	276,000	430,000	371,000	+16
Kern River near Bakersfield.....	489,000	500,000	549,000	-9
² Truckee River at Iceland.....	220,000	310,000	290,000	+7
² Lake Tahoe (rise of lake).....	1.25 ft.	1.89 ft.	1.71 ft.	+10
² Carson River at Clifton.....	115,000	230,000	233,000	-1

¹Natural flow (measured flow corrected for regulation).

²Forecast by Nevada Cooperative Snow Surveys Committee.

seasonal flow was estimated at 45 per cent of the 40-year mean.

With the seasonal flow as estimated, minimum river flow and maximum salinity to be anticipated in the Sacramento-San Joaquin Delta in 1933, were predicted on the basis of their correlation with seasonal flow as established in past seasons.

The 1933 minimum flows expected are, in second-feet, Sacramento River at Red Bluff 2600, at Colusa 1800, at Sacramento 1600; San Joaquin River near Vernalis 600; and combined Sacramento and San Joaquin flow to the delta, 2600. Maximum salinities predicted at delta points are, in parts of chlorine per 100,000 parts of water, O and A Ferry 1000, Collinsville 800, Antioch 700, Emmaton 420, Jersey 380, Three Mile Slough Bridge 300, Rio Vista 200, and Central Landing 70.

"Oh, I wish you'd come down off your high horse," growled the exasperated husband.

"And I wish you would stop using those out-of-date expressions," retorted the ultra-modern wife. "Why don't you learn to motorize your thinking?"

FULFILLMENT OF BRIDGE DREAM AT HAND

(Continued from page 5)

with the governmental details so closely guarded against favoritism or unethical practices. Every detail of this bridge has been laid before the people, and I am proud to say in behalf of this administration that no methods of "expediency" have been permitted beyond the strictest confines of ethics.

Just as the beautiful civic center of San Francisco stands a monument to the honest efficiency of Governor Rolph's administration of that city as its Mayor, so shall the San Francisco-Oakland Bay Bridge stand as a monument to that same principle ruling the Governor's office of California.

A minister discovered two of his flock playing cards on Sunday—and for money.

"Rastus," he said, "don't you know it's wrong to play cards on the Sabbath?"

"Yes, parson," replied the sinner, ruefully, "an', believe me, Ah's paying for mah sins."—*The Humorist*.

Mixture Stability Tests Developed

(Continued from page 13)

1932 CONSTRUCTION

During 1932, the largest single project was in Imperial County, 14.7 miles between Coyote Wells and Dixieland, involving 64,950 tons of mixture, and an average output of 683.7 tons per day. The average daily tonnage of mixture laid for all projects was 614 tons. The average stability of surface mixtures was 2,683 pounds, and the average relative specific gravity was 94.3 per cent. The average surface smoothness was 11.8 inches per mile.

Mixture Design—In the design of asphalt mixtures, it has been found that with most aggregates, increasing the percentage of crushed particles in

and method consists of a multiple-section long wooden drag drawn by the finishing machine. This device was first used by Los Angeles County on similar work and their results are very favorable.

Oil Surfaced Roads

During 1931 and 1932, the present-day trend toward the bituminous treatment of rock surfaced roads has been continued.

Design of Mixtures—Materials for oil mixtures are selected prior to the letting of contracts on the basis of their soundness, respective stabilities, and resistance to disintegration of the completed mix by water.



Sixteen foot one-man finishing float on P. C. C. pavement.

the material passing No. 10 mesh increases stability. Many local materials which would otherwise have to be rejected for lack of stability are made acceptable with the addition of crushed sand, resulting in a considerable saving to the State.

The results obtained to date in mixtures controlled by stability tests indicate that this method is the most valuable development in the art of design and control of mixtures that has been brought forth in the last decade. Pavements so controlled have shown a marked uniformity and improvement in performance.

Finishing—The development of the finishing machine was likewise the greatest advance in the technique of laying smooth riding pavements. The roughness imparted to the pavement from irregularities in side forms is something that can not be removed with the machine. To eliminate this feature, experimental methods of screeding behind the finishing machine are in progress. One method is that of floating transversely behind the finishing machine with the 16' one-man float which was developed for cement concrete. A sec-

Field control is checked at regular intervals by stability tests made on the completed mix as submitted to the laboratory. No existing devices for measuring stabilities of mixtures with lighter oils were available, and the Hveem plastometer was developed in the laboratory for this purpose. In this machine the lateral resistance to deformation with load on a compacted cylinder is measured. The results of the plastometer indicate the probable performance of the mixture under traffic.

SWELL TEST USED

The effect of water on the aggregates in the completed mix is determined by the swell test. A compacted cylinder is immersed in water and the resulting change in volume of the specimen is recorded in percentage of swell, which indicates the performance of the mixture under the conditions of weathering.

The probable effect of rain water in separating the oil from the aggregates is indicated by first mixing a sample of the dry aggregates with the oil and then adding water and stirring to determine

(Continued on page 32)

3500 Miles of Traffic Stripe Placed Last Year Cost \$163,000

A REVIEW of traffic striping work during the past year shows that practically 3500 miles of stripe has been placed at an expenditure of about \$163,000. This includes restriping some of the heavier traveled sections in the Los Angeles and San Francisco territories. On the average, it cost \$40 per mile for placing a 4-inch stripe during the last year.

Fifteen gallons of traffic lacquer was used per mile of stripe which represented about three-quarters of the expense. On all the striping work, whether handled by day labor forces or under contract, particular care is taken to secure a true, even line. The specifications require that a deviation of more than one-half inch from the true line in a distance of twenty feet indicates the standard maintained.

LACQUER IS TESTED

The traffic lacquer is manufactured according to specifications prepared by the testing laboratory. Materials which go into the lacquer are tested separately and the manufacturing is done under the supervision of a testing engineer. The service to which the lacquer is subjected is severe. The prime requirements for a satisfactory material are set forth in the specifications, as follows:

1. It shall remain white under service conditions.
2. It shall dry under ordinary conditions sufficiently to allow traffic over it in from fifteen to thirty minutes after placing.
3. It shall show nonbleeding of oil or asphalt into the stripe.
4. It shall have good covering qualities.
5. It shall have good elasticity.
6. It shall have good durability under extreme weather conditions.
7. It shall satisfactorily resist the abrasive action of traffic.
8. It shall have good visibility.
9. It shall be of such consistency that the material may be used in the State paint spray machines without the use of thinners.
10. The lacquer shall not cake nor become unduly separated from the vehicle in storage.

ECONOMY EXPERIMENT

Determination of the quantity of lacquer required to provide a satisfactory line, having a reasonably usable life, was based on experience with commercial brands of material. With the development of a specification material, designed to fit California conditions, it was felt that an economy might be effected by reducing the quantity of lacquer per mile.

Steep Slopes Make Work Inaccessible in San Gabriel Canyon

(Continued on page 18)

shape where the fill crosses, and a culvert to take the drainage from the canyon would have to follow the course of the old channel for about 800 feet. It was found that a tunnel 580' long to carry the drainage water could be constructed through the ridge on which one end of the fill rests at a decided saving over the culvert method.

DIFFICULT CONSTRUCTION

A number of conditions have made construction on this job extremely difficult. A large part of the work was inaccessible to construction equipment until several miles of temporary or "pioneer" roads were built. To add to the difficulty of the work, the mountains are so steep that a number of slides have occurred. Concrete retaining walls are being built in a number of places where slopes are too steep to support embankments.

One of the most beautiful features of the project is the bridge across San Gabriel River where the new highway leaves the old canyon road. This structure is a steel deck truss bridge with reinforced concrete floor system, rails and approach spans. The south approach span is on a curve and is super-elevated in accordance with the most modern standards of bridge design.

On its completion the Angeles Crest Highway, including the San Gabriel Canyon section, will be one of the most scenic drives in southern California. The formation of two artificial lakes by the dams which are under construction in the canyon will later enhance the already superb natural beauty of the drive.

Accordingly, about 35 miles of stripe was placed in San Bernardino and Riverside counties, using varying quantities of lacquer from nine to fourteen gallons per mile. This work was completed the latter part of November. The test sections will be kept under observation to determine if an economy can be effected in the striping program without too great a reduction in the life and serviceability of the stripe.

The traffic stripe is regarded by the public in general, if letters written to the division are any criterion, as one of the most satisfactory safety measures, particularly on roads with relatively poor alignment, or in foggy areas.

Inspections Cover 245 Water Projects

(Continued from page 19)

WATER RIGHTS

Supervision of Appropriation of Water.

Nineteen applications to appropriate water were received during March; 17 were approved and 5 were denied. In the same period, 32 permits passed to license and 4 were revoked.

Of the more important applications approved during the month were two by Harry T. Wilkerson, 303 First National Bank Bldg., Stockton, California, for 50 cubic feet per second each, or a total of 100 cubic feet per second from Hurdy Gurdy Creek in Del Norte County.

Field work in connection with the inspection of permits was initiated on April 3d and will require visits to 245 projects. Work during the current month will be carried on in San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Diego, Riverside and San Bernardino counties.

ADJUDICATIONS

Whitewater River (San Bernardino and Riverside Counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

Clover Creek (Shasta County). The Clover Creek case is pending in the Superior Court of Shasta County awaiting the court's pleasure in setting a date for hearing.

Butte Creek (Siskiyou County). Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Eagle Creek (Modoc County). A stipulation for judgment was presented to the interested parties at a meeting at Eagleville on March 22, 1933. At this meeting the water users agreed to continue the trial distribution of the waters of Eagle Creek throughout the 1933 irrigation season.

South Fork Pit River (Modoc County). A schedule of allotments for trial distribution during the 1933 season was submitted to the water users and adopted at a meeting held at Alturas on April 11, 1933.

Hat Creek (Shasta County). The stipulation for judgment prepared by the Division is being circulated by counsel among the interested parties.

Deep Creek (Modoc County). A stipulation for judgment was presented to the interested parties at a meeting at Cedarville on March 23, 1933, and is now being circulated among nonresident parties.

Franklin Creek (Modoc County). A stipulation for judgment was presented to the interested parties at a meeting at Davis Creek on March 21, 1933, and is now being circulated among nonresident parties.

Pine Creek in Surprise Valley (Modoc County). A schedule of allotments for trial distribution during the 1933 irrigation season was adopted by the water users at a meeting held at Cedarville on March 23, 1933.

Cottonwood Creek (Modoc County). A schedule of allotments for trial distribution during the 1933 irrigation season was adopted by the water users at a meeting held at New Pine Creek on March 21, 1933.

Cedar, Davis, Deep, Emerson, Franklin, Mill, New Pine, Pine, Cottonwood, Owl and Soldier Creeks and South Fork of Pit River (Modoc County). Water master service on these streams for the 1933 season was commenced on or about April 1, excepting Cedar and Soldier Creeks where the service was begun on March 19, and the South Fork of Pit River where distribution started about April 12.

Pit River in Big Valley (Modoc and Lassen Counties). Supervision of diversions from Pit River in Big Valley for the 1933 season was commenced on April 1.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Office work has continued during the past month in preparing the 1932 report covering the stream flow, diversions, return flow, use of water, salinity, etc., throughout the Sacramento-San Joaquin territory. Field work has included routine maintenance of tide gages and permanent salinity stations in the Delta and Upper Bays; and with the beginning of irrigation on a number of projects the regular field measurements were begun the first week in April.

The flow of the Sacramento River at Sacramento is now about 20,000 second-feet and the combined river flow to the Delta about 23,000 second-feet. This is about the same flow as at the middle of March but a small storm early in April caused a greater flow reaching about 34,000 second-feet at Sacramento for a few days.

Present estimates based upon all available precipitation and snow data are for a 1932-33 seasonal run-off (October to September) of 45 per cent of normal (40-year mean 1889-1929) for the combined Sacramento-San Joaquin drainage. The estimated percentage for the Sacramento River at Red Bluff is 45 per cent, Feather River at Oroville 35 per cent, Yuba River at Smartsville 45 per cent, American River at Fair Oaks 30 per cent, Sacramento River at Sacramento 40 per cent, and San Joaquin River near Vernalis 50 per cent. Under these conditions, minimum stream flow in 1933 may be anticipated as follows: Sacramento River at Red Bluff, 2600 second-feet; at Colusa, 1800 second-feet; at Sacramento, 1600 second-feet; San Joaquin River near Vernalis, 600 second-feet and a minimum combined Sacramento-San Joaquin River flow to the Delta of 2600 second-feet.

In these estimates the assumption is made, on the basis of present preliminary information, that the 1933 rice acreage will be approximately 20 per cent less than in 1932. With low seasonal and summer flow as estimated, maximum salinity in 1933 at Bay and Delta stations is anticipated as shown in the following table. The estimates place the 1933 season as very similar to 1926 and 1929 seasons and the maximum salinity figures for these seasons are shown in the table. A comparison is shown also of the salinity on April 6th in 1926, 1929, 1932 and 1933.

Thirty Dams Now Under Construction

(Continued from preceding page)

Salinity in parts of chlorine per 100,000 parts of water

Station	Max. Seasonal Salinity		
	Actual	Est.	
	1926	1929	1933
Point Orient	2020	1830	---
Bullshead	1690	1370	---
Bay Point	1400	1050	---
O and A Ferry	1100	830	1000
Collinsville	1020	680	800
Emmaton	540	310	420
Antioch	920	600	700
Jersey	470	365	380

Salinity in parts of chlorine per 100,000 parts of water

Station	Salinity on April 6th			
	1926	1929	1932	1933
Point Orient	1410	1530	1020	1240
Bullshead	410	500	120	380
Bay Point	28	260	4	17
O and A Ferry	9	44	1	5
Collinsville	5	9	1	2
Emmaton	---	7	1	1
Antioch	6	6	2	2
Jersey	---	---	3	4

DAMS

To date there have been received 819 applications for approval of dams built prior to August 14, 1929, of which 690 are now under jurisdiction; 112 applications have been received for approval of plans for construction or enlargement; and 384 for approval of plans for repair, alteration or removal.

Thirty dams are under construction or enlargement and 109 are under repair or alteration.

Certificates of approval of 574 dams have been issued to date and six certificates of approval of removal.

Applications Received for Construction.

Dam	Owner	County
Veeh	Geo. H. Veeh	Orange

Applications Received for Alteration.

Dam	Owner	County
Lower San Leandro	East Bay Municipal Utility Dist.	Alameda

Plans Approved for Construction.

Dam	Owner	County
Eaton Wash	L. A. County Flood Control Dist.	Los Angeles

Plans Approved for Alteration.

Dam	Owner	County
Sheffield	City of Santa Barbara	Santa Barbara

Supervision over maintenance and operation is being exercised over existing dams, while more frequent inspections are made of dams under construction, enlargement or repair. Work is being actively pushed on several large dams under construction in Southern California. The city of Los Angeles has completed about half the earth fill on

their Bouquet Canyon Dam. The San Gabriel No. 2 Dam of the Los Angeles County Flood Control District is also about half completed and they have already started work on their larger rock fill structure, San Gabriel No. 1. Plans have also recently been approved for another dam to be built by this district—the Eaton Wash Debris dam—for which bids will be let shortly. This will be a rolled earth structure 38 feet high and storing 1040 acre-feet of water and debris.

The Pine Canyon Dam, being built for the city of Pasadena, is well under way. Material progress is being made on the city of San Diego's El Capitan Dam, both on the rock fill section and on sluicing operations.

COOPERATIVE TOPOGRAPHIC MAPPING

Horizontal and vertical control work in connection with cooperative topographic mapping was carried on during March in San Bernardino, Sonoma and Humboldt counties and topographic mapping proceeded in Riverside, San Bernardino, Fresno and Sonoma counties.

Field work in connection with the Gujarral Hills quadrangle in Fresno County was completed during the month.

The final sheet of Tupman quadrangle, which was issued as an advance sheet under the name of Coles Levee and which covers an area immediately north of Buena Vista Lake in Kern County, is now available, as are also the Arvin and Weedpatch quadrangle sheets. These are all published on a scale of 1:31,680 and copies may be obtained through local stationers or from the Superintendent of Documents, Washington, D. C.

WATER RESOURCES

Ventura County Investigation.

The work of detailed surveys of reservoirs on Piru Creek continued during the month and estimates of time, cost of various types and heights of dams at each of the several dam sites were also in progress. Estimates of underground capacity were completed in Santa Clara Valley, Oxnard Plain and the Moorpark-Camarillo area, leaving the Simi and Ojai areas yet to be completed. Office studies were continued on the best utilization of combined surface and underground conservation of flood flows. The crop map of the entire valley was completed.

Salinas Valley Investigation.

Office work continued on final report which will be completed during the present month or early in May.

South Coastal Basin Investigation.

The crop map of the entire area was completed. Studies were continued on rate of subdivision,

Study Report Issued on Sacramento Basin Unit of Water Plan

(Continued from page 25)

quality of water, capacity of underground basin and draft from underground basins.

Mojave River Investigation.

The field work being conducted by the Federal Bureau of Irrigation Investigations was completed during the month.

Santa Clara Investigation.

Assembly of data for publication of final report on the Santa Clara investigation is proceeding rapidly and it is expected that all material will be in the hands of the printer within the next 30 days.

Pit River Investigation (Modoc and Lassen Counties).

The final review of the report is in progress preparatory to submission to the State Printer.

STATE WATER PLAN

Bulletin No. 26 of the Division of Water Resources, entitled "Sacramento River Basin," one of a series of reports on the State Water Plan, was released during the present month.

The report presents the results of a comprehensive study of the water resources of the Sacramento River Basin. It also contains an inventory of the agricultural lands of the basin and estimates of the irrigable lands and their water requirements. Chapters are devoted to the present status of irrigation; present flood control plans and the effect of the reservoirs of the State Water Plan in increasing flood protection; the present status of navigation and the improvements that would be possible with the State Water Plan; and the present power developments in the State, the estimated rates at which additional electric energy could be absorbed and the value of the energy developed at each power plant of the State Water Plan in the Sacramento River Basin.

The major units of the plan in the Sacramento River Basin are described in some detail and estimated costs for their construction are presented. A recommendation of a first unit for construction in the development is made and an analysis of the accomplishments of this unit is given. An analysis is also presented of the accomplishments of all of the major units of the plan in the basin operated coordinately with those in the San Joaquin River Basin.

The Romans had a system of traffic regulation which might seem harsh to some truckers who often seek special permission to haul over-size loads on the State highways, but it certainly was effective, comments a Minnesota Highway Department bulletin.

The Romans controlled the size of loads over their famous highways by erecting heavy stone columns on each side of the roads at strategic points. Then if a carter tried to put on too wide a load, he simply could not get past these barriers.

Vital Statistics on Dam Applications and Improvements

APPLICATIONS FILED

Applications for approval of plans and specifications for construction or enlargement of dams filed with the State Department of Public Works, Division of Water Resources, during the month of April, 1933.

ORANGE COUNTY—Veeh Dam No. 796. Geo. H. Vee, Santa Ana, owner; earth, 20 feet above stream bed with a storage capacity of 46 acre-feet, situated on unnamed gulch tributary to Newport Bay in Sec. 29, T. 6 S., R. 8 W., S. B. B. and M. For storage and diversion purposes for irrigation and domestic use. Estimated cost \$3,000; fee paid \$30.

STANISLAUS COUNTY—Modesto Dam No. 25. City of Modesto, Modesto, owner; timber-collapsible weir, 8 feet above stream bed with a storage capacity of 670 acre-feet, situated on Tuolumne River in Sec. 33, T. 3 S., R. 9 E., M. D. B. and M. For storage purposes for recreational use. Estimated cost \$10,000; fee paid \$100.

LASSEN COUNTY—Kramer Dam No. 156-6. G. L. Kramer, Beiber, owner; rock and earth fill 16 feet above stream bed with a storage capacity of 103 acre-feet, situated on Widow Valley Creek in Sec. 30, T. 39 N., R. 7 E., M. D. B. and M. For storage purposes for irrigation use. Estimated cost \$1,500; fee paid \$20.

Application for approval of plans and specifications for repair or alteration of dam filed with the State Department of Public Works, Division of Water Resources, during the month of April, 1933.

ALAMEDA COUNTY—Lower San Leandro Dam No. 31-5. East Bay Municipal Utility District, Oakland, owner; rolled fill, situated on San Leandro Creek tributary to San Leandro Bay.

PLANS APPROVED

Plans and specifications for the construction or enlargement of dams approved by the State Department of Public Works, Division of Water Resources, during the month of April, 1933.

LOS ANGELES COUNTY—Easton Wash Dam No. 32-20. Los Angeles County Flood Control District, Los Angeles, owner; rolled earth fill, 37½ feet above stream bed with a storage capacity of 54 acre-feet, situated on Eaton Wash tributary to Rio Hondo, located in Rancho Santa Anita. For debris storage, flood control and conservation purposes, for storage use.

EL DORADO COUNTY—Fallen Leaf Dam No. 461-2. Mrs. Anita M. Baldwin, Los Angeles, owner; gravity, 9 feet above stream bed with a storage capacity of 6,400 acre-feet, situated on Taylor Creek tributary to Lake Tahoe in Sec. 2, T. 12 N., R. 17 E., M. D. B. and M. For storage and diversion purposes, for power and recreation use.

Plans for the repair or alteration of dams approved by the State Department of Public Works, Division of Water Resources, during the month of April, 1933.

ALAMEDA COUNTY—Lower San Leandro Dam No. 31-5. East Bay Municipal Utility District, Oakland, owner; earth, situated on San Leandro Creek tributary to San Leandro Bay, located in Eden Township.

LOS ANGELES COUNTY—Mulholland Dam No. 6-17. City of Los Angeles, Los Angeles, owner; concrete gravity, situated on Weid Canyon in Sec. 3, T. 1 S., R. 14 W., S. B. B. and M.

An English lesson was being given in a foreign school, and the mistress asked if any pupil could make up a sentence containing the words "defense," "defeat" and "detail."

The sentence she got was as follows:

"Ven a cat jumps over defense defeat goes over in front of detail!"—*The Earth Mover.*

Water Applications and Permits

APPLICATIONS FILED

Applications for permits to appropriate water filed with the Department of Public Works, Division of Water Resources, during the Month of April, 1933.

TRINITY COUNTY—Application 7530. W. P. Anderson and R. L. Chase, c/o H. G. Schlomer, Helena, Cal., for 1.5 c.f.s. from North Fork of Trinity River, tributary to Trinity River, to be diverted in Sec. 24, T. 35 N., R. 12 W., M. D. B. and M. For power purposes (58 horsepower). Estimated cost \$40,000.

TRINITY COUNTY—Application 7531. W. P. Anderson and R. L. Chase, c/o H. G. Schlomer, Helena, Cal., for total of 15 c.f.s. from (1) North Fork of Trinity River, (2) North Fork Gulch, (3) Baxter Gulch, (4) Rapid Gulch, (5) Thurston Gulch, (6) Brown Gulch. (1) is tributary to Trinity River and (2,3,4,5 and 6) are tributary to North Fork Trinity River, to be diverted in (1) Sec. 24, T. 35 N., R. 12 W., (2) Sec. 19, T. 34 N., R. 11 W., (3) Sec. 6, T. 34 N., R. 11 W., (4) Sec. 36, T. 35 N., R. 12 W., (5) Sec. 36, T. 35 N., R. 12 W., (6) Sec. 30, T. 35 N., R. 11 W., M. D. B. and M. For mining purposes. Estimated cost \$40,000.

YUBA COUNTY—Application 7532. James G. Bennett, Route 1, Box 242, Hayward, Cal., for 3 c.f.s. from Campbell's Gulch, tributary to North Fork Yuba River, via Willow Creek, to be diverted in Sec. 1, T. 13 N., R. 8 E., M. D. B. and M. For mining and domestic purposes.

SAN DIEGO COUNTY—Application 7533. James K. Banes, Route 1, Box 309-B, Escondido, Cal., for 16,000 gallons per day and 9.7 acre-feet per annum of storage from unnamed stream, tributary to San Diegoito River, to be diverted in Sec. 18, T. 13 S., R. 1 W., S. B. B. and M. For irrigation and domestic purposes (6 acres). Estimated cost \$600.

PLUMAS COUNTY—Application 7534. Ready Bulion Mining Co., 1801 M Street, Sacramento, Cal., for 3 c.f.s. from Round Lake, tributary to Grey Eagle Creek, thence Middle Fork Feather River, to be diverted in Sec. 18, T. 21 N., R. 12 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$500.

LAKE COUNTY—Application 7535. John R. Connelly, E. P. Smith and Stephen J. York, c/o John R. Connelly, 326 Oschner Building, Sacramento, Cal., for 0.05 c.f.s. from unnamed stream, tributary to Clear Lake, to be diverted in Sec. 32, T. 15 N., R. 8 W., M. D. B. and M. For domestic purposes.

ORANGE COUNTY—Application 7537. Charles F. Morton, San Juan Capistrano, Cal., for 150 gallons per day from unnamed stream, tributary to Hot Springs Creek, thence San Juan Canyon, to be diverted in Sec. 33, T. 6 S., R. 6 W., S. B. B. and M. For domestic purposes. Estimated cost \$20.

BUTTE COUNTY—Application 7538. M. B. Turner, Elmer Johns, W. A. Dresser and Edith Bell Turner, c/o M. B. Turner, P. O. Box 87, Oroville, Cal., for 3 c.f.s. from Browns Ravine, tributary to Last Chance Creek, thence West Branch of Feather River, to be diverted in Sec. 20, T. 25 N., R. 5 E., M. D. B. and M. For mining and domestic purposes.

LOS ANGELES COUNTY—Application 7539. Imperial Rock Corporation, 3232 East 50th Street, Los Angeles, Cal., for 1.0 c.f.s. from Los Alamos Creek, tributary to Piru Creek, thence Santa Clara River, to be diverted in Sec. 34, T. 7 N., R. 18 W., S. B. B. and M. For industrial purposes.

DEL NORTE COUNTY—Application 7540 L. W. Wilson and W. D. Hill, c/o L. W. Wilson, 2401 W. 6th Street, Los Angeles, Cal., for 100 c.f.s. from Hurdy Gurdy Creek, tributary to South Fork Smith River, to be diverted in Sec. 36, T. 16 N., R. 2 E., and Secs. 1 and 12, T. 15 N., R. 2 E., H. B. and M. For mining and domestic purposes. Estimated cost \$35,000.

ELDORADO COUNTY—Application 7541. B. W. Stone, 161 Ellis Street, San Francisco, Cal., for 500 c.f.s. and 125,000 acre-feet per annum from Rubicon River, Pilot Creek, Gerle Creek, Loon Lake, Buck Island Lake, Rock Bound Lake and Little South Fork Rubicon River, tributary to American River Drainage Area, to be diverted in Sec. 9, T. 12 N., R. 16 E.,

Sec. 11, T. 12 N., R. 12 E.; Sec. 24, T. 13 N., R. 13 E.; Secs. 1, 31, 34, T. 14 N., R. 14 E.; Sec. 4, T. 13 N., R. 15 E.; Sec. 2, T. 13 N., R. 14 E., M. D. B. and M. For municipal purposes.

PLUMAS COUNTY—Application 7542. S. O. Mitchell, 1400 Chapman Building, Los Angeles, Cal., for 20 c.f.s. from South Fork of Feather River, tributary to Feather River, thence Sacramento River, to be diverted in Sec. 17, T. 22 N., R. 10 E., M. D. B. and M. For mining purposes. Estimated cost \$2,000.

MONO COUNTY—Application 7543. Barney G. Johnson of Mammoth Lakes, Cal., for 1.5 c.f.s. from Cold Creek, tributary to Lake Mary, thence Mammoth Creek and Owens River, to be diverted in Sec. 21, T. 4 S., R. 27 E., M. D. B. and M. For power (0.25 horsepower).

HUMBOLDT COUNTY—Application 7544. Thomas Nelson McDaniel, 2004 4th Avenue, Seattle, Wash., for 300 c.f.s. from Willow Creek, tributary to Trinity River, to be diverted in Sec. 11, T. 6 N., R. 4 E., H. B. and M. For mining and domestic purposes. Estimated cost \$300,000.

HUMBOLDT COUNTY—Application 7545. Frank E. Kelly, Mrs. M. T. Holland, Mrs. J. C. Wallace, Miss Rita Regli and Miss Ella J. Kelly, c/o Frank E. Kelly, Eureka, Cal., for 2 c.f.s. from Mad River, tributary to Pacific Ocean, to be diverted in Secs. 24 and 25, T. 6 N., R. 1 E., H. B. and M. For irrigation purposes (110 acres).

PERMITS ISSUED.

Permits to appropriate water issued by the Department of Public Works, Division of Water Resources, during the month of April, 1933.

NEVADA COUNTY—Permit 4081, Application 6870. Issued to Ruth Properties, Inc., Grass Valley, Cal., March 17, 1933, for 50 second-feet from Steep Hollow Creek, in Secs. 14 and 20, T. 16 N., R. 10 E., M. D. B. and M. For mining purposes. (Omitted from March list).

SAN DIEGO COUNTY—Permit 4089, Application 6649. Issued to Southern California Water Supply Company, 1010 Bank of Italy Building, San Francisco, Cal., April 5, 1933, for 18.6 second-feet from Sweetwater River, in Sec. 17, T. 16 S., R. 2 E., S. B. B. and M. For irrigation and domestic purposes on 5000 acres. Estimated cost \$1,500,000.

ORANGE COUNTY—Permit 4090, Application 7462. Issued to Geo. H. Veeh, Route 2, Box 224, Santa Ana, Cal., April 11, 1933, for 46 acre-feet of water for storage from an unnamed gulch in Sec. 29, T. 6 S., R. 8 W., S. B. B. and M. For irrigation and domestic purposes on 43 acres.

PLUMAS COUNTY—Permit 4091, Application 7410. Issued to H. E. Parker, Meadow Valley, Cal., April 13, 1933, for 0.2 second-foot from Little California Creek, in Sec. 5, T. 22 N., R. 8 E., M. D. B. and M. For mining and domestic purposes. Estimated cost \$100.

SAN JOAQUIN COUNTY—Permit 4092, Application 7332. Issued to Gibraltar Development Company, Ltd., 928 Bank of America Building, Stockton, Cal., April 13, 1933, for 50 second-feet from Deane's Ravine and South Fork Canyon Creek, in Sec. 7, T. 21 N., R. 11 E., M. D. B. and M., and Sec. 12, T. 21 N., R. 10 E., M. D. B. and M. For mining purposes. Estimated cost \$150.

BUTTE COUNTY—Permit 4093, Application 7114. Issued to Richvale Irrigation District, Richvale, Cal., April 15, 1933, for 15 second-feet from Dry Creek, in Sec. 6, T. 19 N., R. 2 E., M. D. B. and M. For irrigation purposes on 4200 acres. Estimated cost \$2,000.

VENTURA COUNTY—Permit 4094. Application 7453. Issued to W. E. Matthews, Box 323, Maricopa, Cal., April 18, 1933, for 0.05 second-foot from Blue Rock Spring, in Sec. 20, T. 9 N., R. 23 W., S. B. B. and M. For domestic and irrigation purposes on 3 acres. Estimated cost \$600.

DEL NORTE COUNTY—Permit 4095, Application 7470. Issued to G. M. Willoughby et al., Crescent City, Cal., April 26, 1933, for 3 second-feet from Cedar Springs, in Sec. 36, T. 17 N., R. 2 E., H. M. For mining purposes. Estimated cost \$25.

Value of Preliminary Investigation In Bridge Planning and Construction

By **EVERETT L. WALSH**, Engineer of Investigation, Bridge Department

TO the casual observer as he sees a contractor start work on a bridge project, the visual evidence symbolizes the actual beginning of all work on the project; to the bridge engineer it is really only the beginning of the end.

What goes on behind the scenes before actual construction work is started?

An important part of the work of the Bridge Department of the Division of Highways is the preliminary investigation which involves the highway bridge surveys and the gathering of pertinent data which are essential before a comprehensive and complete set of plans can be prepared. A lack of adequate information would render useless the refinements of design and structural details found in the modern highway bridge. It is impossible to design the bridge or even to select the economically suitable type of structure without gathering in advance complete and accurate information.

MANY PROBLEMS INVOLVED

Foundation—A structure, no matter how well built it may be, is only as safe as the foundation upon which it rests. Bridges must be built where needed regardless of physical conditions. Situations varying from solid rock to silt two hundred feet or more deep are likely to be encountered.

For example, a bridge now under construction in the northern part of the State presented an interesting problem which hitherto had never been encountered in the annals of bridge building in the State of California. It was necessary to found a major bridge structure upon diatomaceous earth—a silicified, chalk-like material weighing only 51 lbs. per cu. ft.

Samples of this material were obtained and tested for compaction and compressive strength under dry and saturated conditions and the exact bearing value was predetermined. This case shows strikingly that a comprehensive knowledge of the character and location of subsurface strata is of vital importance in order that a structure may be safely and economically designed.

CONDITIONS MUST BE KNOWN

Surface indications are very often deceptive. A casual inspection or superficial exploration might indicate suitable foundation at a shallow depth. However, excavation during construction operations may later disclose a softer underlying material which would require piling or wider footings. The necessary change in plans to meet the actual conditions generally involves expensive work, is bound to cause delay, and may even result in the abandonment of work already completed.

Traffic—A study must be made of the amount, speed, and character of traffic which the bridge will carry. Consideration must be given to geographic location, proximity to towns, the effect of adjoining roads and the need for sidewalks. After careful analyses of all influencing factors a prediction must be made of the maximum traffic that is to be expected during the service life of the structure.

Hydrography—If the bridge is over a stream of any magnitude it is necessary to obtain a complete waterway survey to determine the character of the watershed and stream behavior data. Considerable information is required regarding stream flow data such as rainfall charts, gradient of stream, cross-sectional area of stream at low and high water stages, high water marks, frequency and duration of floods and velocity of current.

STREAM STUDIES

California has many streams which are subject to erratic and unexpected floods. Consequently a complete study of the stream behavior—including the character, direction and velocity of currents at the different water stages, the stream alignment, tendency to scour or erode, necessity for embankment slope protection and the amount of drift the stream carries, must necessarily be obtained to plan intelligently the most economical and suitable structure for the site.

Complete and accurate information regarding the frequency, magnitude and dura-

FOUNDATION SCOUTS

for the San Francisco-Oakland Bay Bridge spent five months making borings of the bay floor from a barge outfit. They made 7,897 feet of jet borings and took 837 feet of rock cores with diamond drills.



tion of floods is essential as in some cases it is not economically justified to design a bridge for very rare floods where considerable cost can be avoided.

Materials—Complete data concerning the availability and cost of construction materials are necessary in order to determine the proper selection of type. For example there are many locations where concrete aggregates are not available in the locality of the proposed site. At such locations the cost of a concrete structure is greatly increased.

DECIDING FACTORS

A reconnaissance must be made of the vicinity and samples obtained of all promising material to determine their suitability. In many outlying districts the transportation facilities, the location of shipping points and the length of haul to the site are the deciding factors in the choice of materials of construction. In certain locations, due to the crooked mountainous roads over which the materials must be hauled, the structural members must be designed in small sections with more field splices detailed than would otherwise be necessary. The source and quantity of water to be used for construction purposes must be ascertained. When no previous knowledge is available regarding the quality of the water, a laboratory analysis is necessary and an estimate must be made of the cost of conveying it to the job.

Special Considerations—A few other factors influencing the design and construction of a bridge are listed which must be predetermined in order to work out properly the most satisfactory solution. Meteorological data involving temperatures, rainfall, snow, ice, fire hazards and drainage considerations



DIAMONDS WERE saved from loss by a drill cage devised to protect the boring equipment.

must be analyzed for various purposes. The details of removing or disposal of all obstructions and the ownership and franchise rights of all private and public utilities occupying the right of way must be ascertained.

DETOURS PLANNED

Details for providing a detour as well as maintaining and protecting traffic must be worked out in advance. It is necessary to predesignate the consideration to be given

Weather a Factor in Bridge Designing

(Continued from page 29)

to esthetic features due to natural scenic conditions and to investigate the effects and action of salt air, alkali, seawater, teredos, termites and marine borers. Special construction methods and the sequence of work are determined in advance of the award of contract so as to plan intelligently for all possible contingencies.

It will be seen that there are many factors involved and much information to be obtained before it is possible to determine the control features and evaluate the tentative type selections in order to decide the kind of construction most suitable to the particular phases implicated.

Type Selection—It has been said that correct type selection is the very keystone of economy. After the controlling features of the problem have been investigated in the field, it becomes necessary to make more detailed economic studies of the various types which are likely to fit the conditions before starting actual detailed design and preparation of plans.

The type which may be constructed with the least amount of money for the first cost of construction may not prove the most economical after computing the annual maintenance cost and the amortization of cost during the service life of the structure—especially after due consideration is given to permanence, weather conditions, fire hazard, esthetics and certain intangible factors influencing the type.

FALSE ECONOMY

There are many types of structures which may be designed to fit almost any site and the failure to investigate thoroughly every phase of the problem usually results in a waste of money far in excess of the comparatively small amount of money spent in preliminary investigation and proper engineering analysis.

All preliminary survey data are made a part of the permanent records which are kept on file for each structure in the State Highway System. During the life of the structure, inspection reports and maintenance records are added to these files. When a structure has reached the end of its service life and it becomes necessary to

replace it, such a complete authentic record is invaluable.

The ultimate object of all the preliminary investigation as described above is to furnish definite information from which a consistent and proper design may be incorporated in an economical and otherwise satisfactory bridge. If, to save money on engineering costs, incomplete preliminary information is secured, the bridge must be designed from assumptions which are quite likely to be incorrect.

FALSE ECONOMY

The designer may work up an accurate design based on a poor "guess" of physical conditions. He may plan the bridge too short, in which case it might be washed out by future floods; may design footings too small, causing settlement; may design the bridge too narrow to provide for future traffic; or to play safe, he may design the bridge with excessive length. In each case there would result an ultimate loss of capital investment.

A thousand dollars spent on preliminary investigation which saves the State a later expenditure of ten thousand dollars increases the engineering costs, but benefits the State to the extent of nine thousand dollars.

No intelligent person would think of allowing a surgeon to cut him up without his first making a complete diagnosis or "preliminary investigation" of the situation. The Bridge Department makes a complete investigation of each bridge site before any design is started, with the result—even though the layman may not know it—that the most suitable and satisfactory bridge is built with a dollar return for every dollar spent.

SPEED TREND TO AFFECT HIGHWAY DEVELOPMENT

Average cruising speed of motor vehicles has increased from about 15 miles per hour in 1902 to approximately 45 miles per hour in 1932, states a report reaching the Automobile Club of Southern California. It is indicated by these figures that the average cruising speed of cars may increase to 70 miles per hour in 1942 and 100 miles per hour in 1952, providing highways are developed to sustain the high speeds at which modern automobiles are capable of traveling, notes the club.

New Alignment to Relieve Congestion in City of Ventura

(Continued from page 17)

and approximately one-half of the \$30,000 which the improvement cost.

On the section of the Oxnard-Serra Highway, between Venice and El Segundo, Los Angeles County desired that a 40-foot pavement on an 80-foot roadbed be placed between Washington Boulevard and El Segundo, while the State's plan for construction on this section of heavily traveled highway had been a 30-foot pavement on a 60-foot roadbed. The need for this type of superhighway was apparent and so, joining forces with Los Angeles County, the Division of Highways constructed the wider pavement, the county bearing one-fourth of the cost.

Similar agreements were made with Los Angeles County for placing 40-foot pavements where this route passes through Redondo Beach and Laguna Beach.

RELIEVES CITY CONGESTION

In the city of Ventura construction on a new alignment of the Coast Route is under way and the State is constructing a new bridge on this revised alignment across the Ventura River. The new alignment of this important arterial will follow along Meta Street from Peking to West Hemlock streets and the 56-foot width of pavement between curbs will relieve the congestion of traffic which has long been felt at this point. In addition to constructing the new bridge at the northerly city limits of Ventura, the State is cooperating with the city and county by providing thirty sixths ($\frac{3}{16}$) of the construction costs, an amount of approximately \$150,000.

The largest single cooperative project involves the construction of the Coast Route along new alignment through the undeveloped areas within the city limits of San Diego. This project includes many contracts, both city and State, and construction is being spread over a period of years.

The State's share in this improvement during the current biennium has included seven contracts under which 7.3 miles of pavement have been placed, 4.4 miles of roadbed are being graded and three bridges and one grade separation are now under construction. These seven State contracts amount to approximately \$550,000. The city of San Diego has cooperated in providing the right of way and for certain portions of the work.

Bids and Awards of Contracts Made on Highway Projects

CONTRA COSTA COUNTY—Oiling roadside vegetation, approximately 19.1 miles. District IV, Mt. Diablo Park Roads. Basalt Rock Co., Inc., Napa, \$3,500; Oilfields Trucking Co., Bakersfield, \$3,850; Highway Builders, Ltd., San Anselmo, \$4,225; Lee J. Immel, Berkeley, \$3,687; A. Teichert & Son, Inc., Sacramento, \$4,300; C. F. Frederickson & Sons, Lower Lake, \$3,500; A. Mitchell, Sacramento, \$4,350; U. B. Lee, San Leandro, \$3,950. Contract awarded to Pacific Truck Service, Inc., San Jose, \$3,475.

FRESNO COUNTY—Between Church Avenue and California Avenue in Fresno, about 0.7 mile to be graded and paved with asphalt concrete. District VI, Route 4, Section B. Valley Paving and Construction Co., Fresno, \$32,789. Contract awarded to Union Paving Co., San Francisco, \$31,543.

KERN COUNTY—Between Oak Glen and one mile north of Grapevine Station, about 3.7 miles to be graded and paved with Portland cement concrete. District VI, Route 4, Section A. Basich Bros., Torrance, \$380,762; George Pollock Co., Sacramento, \$415,768; Granfield, Farrar & Carlin, San Francisco, \$372,790; Weymouth Crowell Co., and E. Penn Watson, Jr., Los Angeles, \$387,244; Von der Hellen & Pierson, Castiac, \$356,111; W. E. Kier Construction Co., San Diego, \$513,451; Hanrahan Company and J. P. Holland, Inc., San Francisco, \$360,818; Frederickson & Watson Construction Co., and Frederickson Bros., Oakland, \$382,820; Jahn & Bressi Construction Co., Inc., Los Angeles, \$361,439. Contract awarded to Griffith Company, Los Angeles, \$355,327.

MENDOCINO COUNTY—Oiling about 19.7 miles between McDonald and Boonville. District IV, Route 48, Section A. Oilfields Trucking Co., Bakersfield, \$4,550; C. F. Frederickson & Sons, Lower Lake, \$4,095; Pacific Truck Service, Inc., San Jose, \$4,077; Peninsula Paving Co., San Francisco, \$4,322; Hein Bros., Basalt Rock Co. and A. Helwig, Petaluma, \$4,445; Highway Builders, Ltd., San Anselmo, \$4,375. Contract awarded to Chas. Kuppinger, Lakeport, \$3,850.

PLACER COUNTY—Between Gold Run and Airport, 11.5 miles in length to be surfaced with bituminous crushed gravel or stone. District III, Route 37, Sections C, D and E. M. J. Bevanda, Stockton, \$173,014; Central States Contracting Co., Oakland, \$162,253; A. Teichert & Son, Inc., Sacramento, \$139,393; Hein Basalt Rock Co., Petaluma, \$167,948; N. M. Ball, D. McDonald, E. B. Bishop, Sacramento, \$175,953; Hemstreet & Bell, Marysville, \$166,335; Frederickson & Watson Construction Co., Oakland, \$135,337; Union Paving Co., San Francisco, \$158,094. Contract awarded to Peninsula Paving Co., San Francisco, \$132,831.

SANTA BARBARA COUNTY—An overhead crossing over the Southern Pacific Company's tracks at Elwood consisting of one 68-foot 6-inch deck plate girder span, four 30-foot reinforced concrete girder spans and two 20-foot reinforced concrete girder spans. District V, Route 2, Section G. Weymouth Crowell Co., Los Angeles, \$34,833; Associated Construction, Inc., Los Angeles, \$28,352; Neves & Harp, Santa Clara, \$29,941; Clark & Campbell, Los Angeles, \$28,577; J. E. Haddock, Ltd., Pasadena, \$30,861; Dimmitt & Taylor, Los Angeles, \$34,429; Oberg Bros., Los Angeles, \$28,975; Sam Sciarrino, San Jose, \$33,390; Artukovich Bros., Hynes, \$31,425; R. R. Bishop, Long Beach, \$31,336; Bodenhamer Construction Co., Oakland, \$29,893. Contract awarded to M. B. McGowan, San Francisco, \$28,158.

SANTA CRUZ COUNTY—Oiling as a dust palliative, approximately 7 miles, between Slippery Rock Maintenance Station and Waterman Switch. District IV, Route 42, Section A. Pacific Truck Service, Inc., San Jose, \$1,757; Granite Construction Co., Ltd., Watsonville, \$1,767; Oilfields Trucking Co., Bakersfield, \$1,748; A. Mitchell, Sacramento, \$2,280; Peninsula Paving Co., San Francisco, \$1,672; U. B. Lee, San Leandro, \$2,850. Contract awarded to L. A. Brisco, Arroyo Grande, \$1,662.

TUOLUMNE AND MARIPOSA COUNTIES—Twenty-six miles of existing roadbed to be treated with fuel oil and asphalt road oil as dust palliatives. District X, Routes 40 and 18, Sections B, C, D, E, F and A. Oilfields Trucking Co., Bakersfield, \$8,655.

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Contractors' License Fee Reduced 50 % By Legislative Act

LEGISLATION reducing the license renewal fee of California contractors 50 per cent and providing for tightening of the State Contractors' Act was enacted into law May 26th with the approval by Governor James Rolph, Jr., of Assembly Bill No. 780.

Under provisions of the measure, the fee for renewal of licenses for the new fiscal year beginning July 1 will be cut from \$10 to \$5.

This economy measure, it is expected, will result in a saving of more than \$115,000 for California's army of 23,000 registered contractors. The measure carried an urgency clause, making it effective immediately upon approval by the Governor.

In addition to providing a reduction in the fee, the measure provides for tightening the provisions of the act and also more stringent regulation of the unscrupulous or unethical fly-by-night contractor or "jerry builder," according to Col. Carlos W. Huntington, Registrar of Contractors and Director of Professional and Vocational Standards. The measure will in no way interfere with the legitimate operations of the honest and reputable contractor, Registrar Huntington said.

The measure retains the present \$200 exemption clause, a move to reduce this to \$50 having been defeated on the floor of the Senate and Assembly.

MIXTURE TESTS DEVELOPED

(Continued from page 22)

the percentage of separation that results after the water has thoroughly soaked the mixture.

Oil contents are set from a series of curves relating oil to surface area as determined by a grading analysis; the individual curve for any material being selected by laboratory tests in advance of field design.

Finishing—Some improvement was made in the manner of finishing oil mixtures during the past season. It was found desirable to hold in reserve a small amount of uncompressed material, in order to feed it in during the blading and rolling of the finished road surface. This method has been instrumental in improving the riding qualities of this type of road.

Slurry Base—The so-called slurry type base course has become standard practice where crushed material must be provided for base for oil mixtures. Where suitable cementing material is available locally, it is applied direct without crushing, and processed in place. Comparative roughness shows that care in preparing the base is reflected in the riding qualities of the completed oil mix.

In Memoriam

WILLIAM L. KRASEVAC, an employee of District III, Division of Highways, suffered a fatal accident on Thursday, March 30, that resulted in his death about twelve hours later, bringing sorrow to his family in Grass Valley, to his coworkers, and to his many friends outside of State service.

Mr. Krasevac was assisting J. C. Womack, Location Engineer, in obtaining topographical data with respect to reconstruction of the State highway between Folsom and Placerville. Shortly after Mr. Womack had recorded an estimated clearance between the ground at the survey center line and the lowest wires of a high tension power line crossing the survey, he heard an electric explosion behind him, and turning, saw Mr. Krasevac lying unconscious on the ground with his clothes ablaze and a solid sheet of flame between the wires and Krasevac's body.

A cloth tape, with metallic reinforcement, which he is believed to have been using in an attempt to measure the clearance distance, created a contact between the power line and his body, causing burns which later resulted in his death, in spite of the flames being beaten out at once by Mr. Womack and prompt surgical and hospital aid being rendered. The exact cause of the accident, however, will never be known, for he was unconscious from the time of the tragedy until his death.

The deceased had been with the Division of Highways for the past three years, during which time, by his industry, capability, and fine disposition, he had earned the high regard of his fellow workers.

He was 23 years old, the son of Mr. and Mrs. Lawrence Krasevac, of Grass Valley, and is survived, in addition to his parents, by three brothers and three sisters, all living in Nevada County.

BIDS AND AWARDS OF CONTRACTS

(Continued from page 31)

Contract awarded to C. F. Frederickson & Sons, Lower Lake, \$7,891.

VENTURA COUNTY—Between Oxnard and Santa Clara River Bridge, 2.3 miles of earth shoulders to be treated. District VII, Routes 2 and 60, Sections C. B. Jacob P. Immel, Ventura, \$2,669; Santa Maria Construction Co., Santa Maria, \$2,686; Square Oil Co., Los Angeles, \$2,890; L. A. Briscoe, Arroyo Grande, \$3,043; Western Motor Transfer, Inc., Santa Barbara, \$3,230; Oilfields Trucking Co., Bakersfield, \$3,757. Contract awarded to Southwest Paving Co., Los Angeles, \$2,584.

ARCHITECTURAL AWARDS

LOS ANGELES STATE BUILDING—Contract for installing passenger elevator, awarded to Consolidated Steel Corporation for \$23,000.

SAN QUENTIN STATE PRISON—Contract for installing water tube boiler to California Steel Products Co., for \$10,477.

SAN JOSE ARMORY—Contract for general work to Wm. Spivock for \$33,565; contract for electrical work to Coast Electric Service, Inc., for \$1,238; contract for plumbing and heating to Wm. F. Serpa for \$2,923.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

EARL LEE KELLY-----Director

ERIC CULLENWARD-----Deputy Director

DIVISION OF HIGHWAYS

CALIFORNIA HIGHWAY COMMISSION

HARRY A. HOPKINS, Chairman, Taft
TIMOTHY A. REARDON, San Francisco
PHILIP A. STANTON, Anaheim
FRANK A. TETLEY, Riverside
DR. W. W. BARHAM, Yreka
C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary
HUGH K. McKEVITT, Attorney, San Francisco

HEADQUARTERS STAFF, SACRAMENTO

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L. V. CAMPBELL, Office Engineer
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FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
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R. H. STALNAKER, Equipment Engineer
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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Sacramento
J. H. SKEGGS, District IV, San Francisco
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E. E. WALLACE, District VI, Fresno
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H. M. STAFFORD, Sacramento-San Joaquin Water
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MABEL PERRYMAN, Secretary

DIVISION OF ARCHITECTURE

GEO. B. McDOUGALL, State Architect, Chief of
Division
W. K. DANIELS, Administrative Assistant
P. T. POAGE, Assistant Chief

HEADQUARTERS

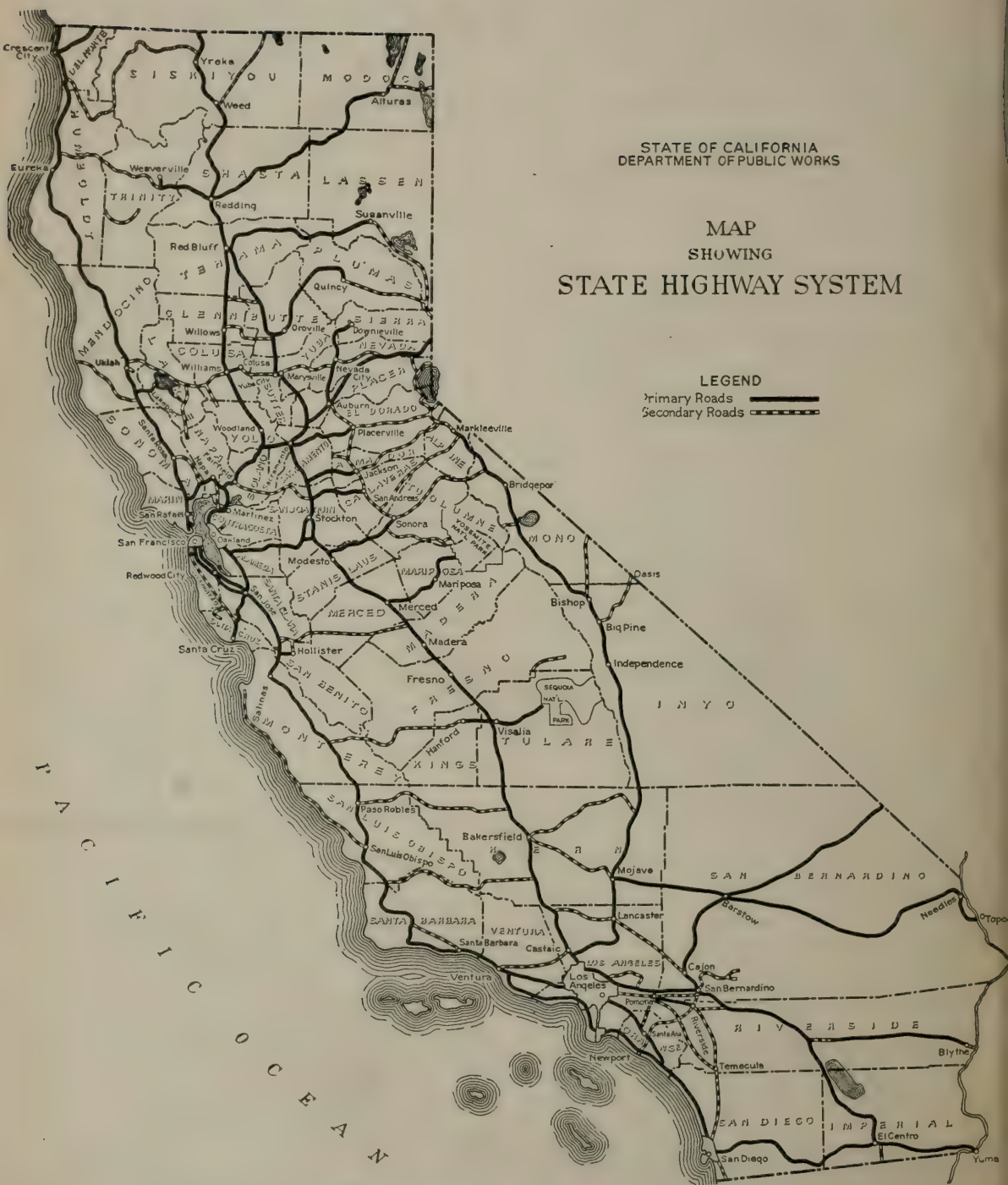
H. W. DEHAVEN, Supervising Architectural Drafts-
man
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification
Writer
C. E. BERG, Supervising Estimator Building Con-
struction
J. W. DUTTON, Principal Engineer, General Con-
struction
W. H. ROCKINGHAM, Principal Mechanical and
Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed
Port of San Diego—Edwin P. Sample

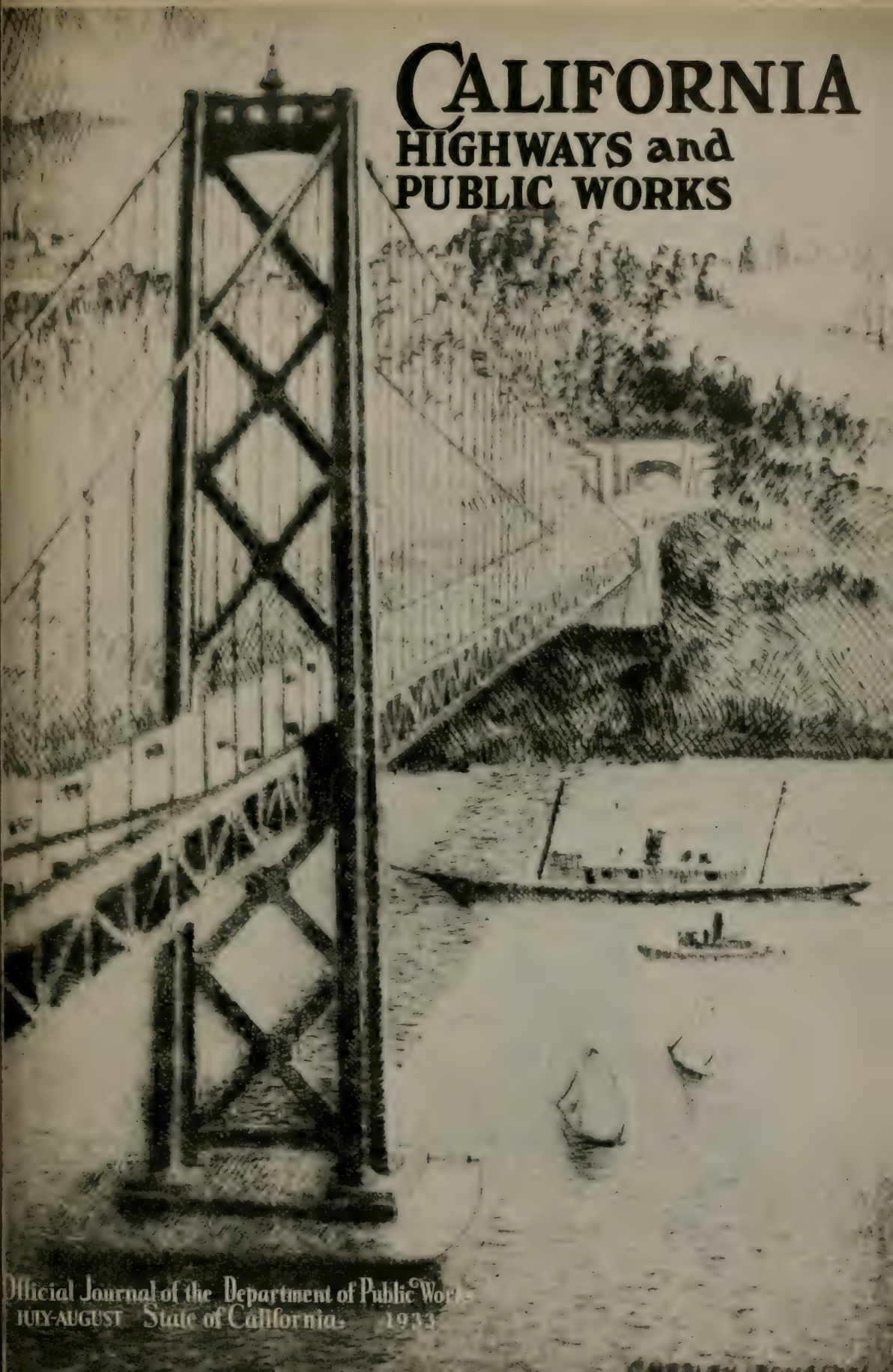


STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

MAP
SHOWING
STATE HIGHWAY SYSTEM

LEGEND
Primary Roads —————
Secondary Roads - - - - -

Seattle Public Library



CALIFORNIA HIGHWAYS and PUBLIC WORKS

Official Journal of the Department of Public Works
JULY-AUGUST State of California 1933

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California's Greater Highway System Marks New Era in Transportation

Addition of 6800 Miles Under Breed Act Permits
Continued Rapid Traffic Growth and Gives
State Sixth Mileage Rank in Nation

By H. A. HOPKINS, Chairman California Highway Commission

ON June 5th, this year in the council chamber of the State Capitol, Governor James Rolph, Jr., by affixing his signature to Senate Bill No. 563 made new history in the development of California's highway system.

Through the action of the 1933 Legislature there was added to the 7350 miles of highways in the State's system approximately 5900 miles of secondary highways making a total mileage now of about 13,250 miles. To this there was added approximately 900 miles additional of city streets that will provide through arteries connecting with State highways affording continuous routes with no dead ends.

Governor Rolph's signature brought into existence a law that will mean the realization of a hope and ambition on the part of the political subdivisions of the State constituting our cities and counties.

The benefits to the counties will accrue from the fact that they will be relieved from maintenance costs to the extent of nearly \$6,000,000 per annum and to the cities in that one-quarter cent of the gasoline tax

money taken from the State's 2-cent share will be expended on through streets with a yearly expenditure of approximately another \$6,000,000.

Another benefit accruing to the cities and counties will be the elimination of any neces-

sity for assessments on city streets and district assessments to construct county roads.

The entire 6600 miles called for under the Senate concurrent resolution was recommended by the California Highway Commission upon suggestions by interested State organizations and boards of supervisors as well as those initiated by the State engineers and commission.

This recommendation was accepted by the State legislature with very few changes in the way of eliminations or additions because it was recognized that the county roads suggested for inclusion were the very best roads that could be selected

after thorough investigation and study by the State engineers and the holding of countless hearings by the commission at which projects were presented by delegations from every section of the State.



H. A. HOPKINS

Governor Rolph, Breaking Ground for Bay Bridge, Puts Hundreds to Work

By C. H. PURCELL, State Highway Engineer

GROUND has been broken.

The first cofferdam is under construction.

Piles are being driven in the bay for caisson working platforms.

The cutting edge for the third giant steel and timber caisson has been launched at the Moore Dry Docks.

In short, the San Francisco-Oakland Bay Bridge is in construction.

Governor James Rolph, Jr., lifted the first spade of earth on Yerba Buena Island on Sunday, July 9, with a golden shovel donated by the San Francisco Motor Car Dealers Association, of which William L. Hughson is president.

President Roosevelt set off the first blast.

Former President Herbert C. Hoover took the spade from Governor Rolph and lifted the second shovel of earth.

MANY MEN AT WORK

Members of the Governor's Financial Advisory Committee, and Director of Public Works, Earl Lee Kelly all lifted shovels of the earth that broke the soil of the island for the bridge construction.

In accordance with Governor Rolph's mandate that work be started in many sectors of the bridge simultaneously, men are now working at Pier 24, San Francisco, at Rincon Hill, in boats and on barges on the bay, at Asiatic Wharf concrete mixing plant, on Yerba Buena Island, and at Moore Dry Docks.

The citizens organizations of northern California, in their eagerness for good news unconsciously bring pressure upon the officials in charge of the construction of the bridge to be placed in the light of boasting about this project. For that reason it is our belief that too much has been said about the great totals on this project and perhaps too little on the actual progress that is being made.

PROGRESS IS RAPID

This progress is not unimportant. As a matter of fact our progress history to date

COVER PAGE ILLUSTRATION SHOWS YERBA BUENA SPAN

The picture on our cover page is a reproduction of an etching of the San Francisco-Oakland Bay Bridge depicting the tower and span of the west channel crossing nearest to Yerba Buena Island. The view embraces the west anchorage on the island, the entrance to the tunnel and in the distant background a bit of Berkeley skyline on the left and a suggestion of the east channel structure and the city of Oakland on the right.

reveals that the engineering surveys, preliminary work, organization and financing, have progressed with remarkable rapidity for a project of such magnitude as the San Francisco-Oakland Bay Bridge.

Another gratifying feature is that the structural work is proving our preliminary engineering surveys, borings and specifications.

When the Transbay Construction Company, contractors on the \$6,957,100.68 contract for the substructure of the west bay half of the bridge, struck rock with a clamshell dredge at the tip of Pier 24 in San Francisco at a depth of 80 feet below the surface of the water, they verified the accuracy of our borings.

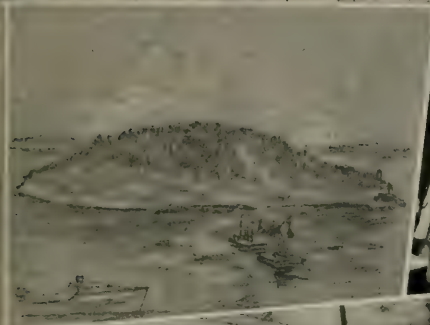
The substance of this rock also checked with our estimates and tests, which was gratifying to this division of the Department of Public Works.

COFFERDAM BEING SUNK

Since rock was reached at Pier 24 the framework and bracing for the cofferdam has been built at Moore Dry Docks, launched, towed across the bay, and set into position.

This cofferdam is now being built up and sunk, and the steel sheet piling will soon be driven in a stockade form around the framework of the cofferdam, and within a few weeks dump buckets will be laying concrete on the rock 80 feet below the surface of the water for the most westerly pier of the San

(Continued on page 12)



MAKING CALIFORNIA HISTORY—Governor James Rolph, Jr., turned the first shovel of earth at the ground-breaking ceremonies for the construction of the San Francisco-Oakland Bay Bridge on Yerba Buena Island July 9 in which the President of the United States, Franklin Delano Roosevelt, and ex-President Herbert Clark Hoover participated. No. 1—Governor Rolph and ex-President Hoover posed for the photographers with fair representatives of the bay cities. No. 2—Governor Rolph lifting the first spade of earth with A. P. Giannini on his right. No. 3—On the speakers' stand, Governor Rolph is seated between Governor F. B. Balzar of Nevada and ex-President Hoover. Behind the Governor stands Earl Lee Kelly, Director of Public Works. At left are Rear Admiral G. W. Laws and Harrison S. Robinson. No. 4—First blast set off by President Roosevelt by wire from Washington.

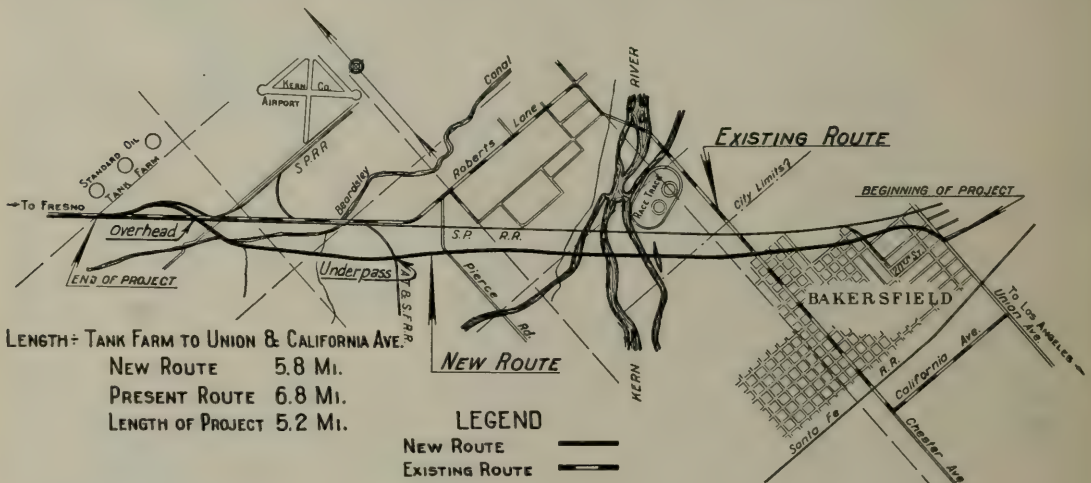
Bakersfield Realignment Cuts Out Five Grade Crossings; Avoids Traffic

By **WALTER BEUTHEL**, Assistant Highway Engineering Draftsman

IN past years, under legal and financial limitations, State highway construction ordinarily did not extend within the boundaries of incorporated cities. It was therefore not possible to greatly influence the routing through the larger cities and the through traveler was left at the city limits to find his way through a maze of local traffic and confusing signs to the place where he could again find a State Highway and proceed on his way. As the city streets were laid out for local traffic only, they usually formed neither the shortest nor the safest route for the stranger whose chief interest was to reach his destination.

The planning commission of Kern County and the city of Bakersfield furnished a complete analysis of the available routes in accordance with modern standards and compiled without prejudice to the rights of through traffic. This report was given careful consideration by the State engineers and the Highway Commission, who approved what is known as the "railroad route" on August 26, 1932. The decision selecting this route was made because of advantages with respect to distance, directness, curvature, service to business and residence districts and particularly, safety and service to the through traffic.

The saving in distance over the present



Recognizing that with the rapid improvement of highways proper service through cities was a necessity, this situation was remedied by legislation in 1931.

STATE COOPERATED

Bakersfield, just north of the "Ridge Route" on the Golden State Highway U. S. 99, was among the first of the cities to apply for the benefits of the State participation in the construction of highways within municipalities. In accordance with adopted policy based on the legislative enactment, the State cooperated with the city council and county supervisors in considering problems of rights of way and routing.

route is one mile and the length is one-half mile less than the next best route. The curvature has been reduced from 368° to 202° and the minimum radius increased from that required to turn in a city street to 1500 feet.

LOCAL CONGESTION RELIEVED

The new route serves the business, residence and suburban district well, crossing the main thoroughfare at the north end of the business district, and providing direct access to those desiring to stop in the city. By using a minimum of existing streets and constructing a new crossing of the Kern River, relief from local congestion is provided. The route parallels the railroad but at sufficient distance

(Continued on page 14)



PROFITING BY COOPERATION with the State in rerouting U. S. 99 through the city, Bakersfield will have a fine, wide arterial for through traffic, relieving city congestion and avoiding grade crossings. No. 1—Chester Avenue crossing of Southern Pacific that will be eliminated. No. 2—New bridge over Kern River showing wide concrete deck under construction. Nos. 3 and 4—Views of present narrow old concrete arch bridge at times inadequate for traffic. No. 5—Reinforced concrete piers of new bridge are 54 feet wide.

New Law Regulates Advertising Signs Along Highways as a Safety Measure

By MORGAN KEATON, Assistant Deputy Director of Public Works

The 1933 Legislature enacted a law effective August 21st providing for the regulation of advertising structures and signs on property adjacent to highways outside incorporated cities or towns. The Director of the Department of Public Works who is charged with the enforcement of the act has appointed Assistant Deputy Director Morgan Keaton to supervise the carrying out of the new law. Mr. Keaton analyses and explains the provisions of the act in the following article.

A NUMBER of States have heretofore passed laws intended to prevent the encroachment of signs and sign-posting structures and advertising devices on the State highways. In many instances these efforts have been abortive for various reasons and the end sought has only been partially attained.

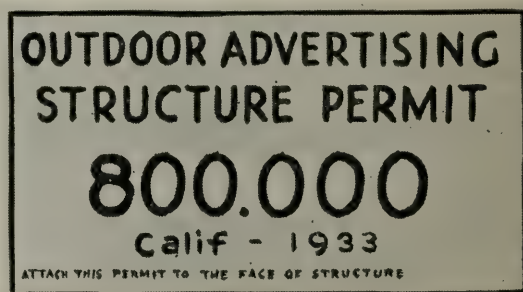
The law passed by the 1933 Legislature known as Senate Bill No. 1198, introduced by Senator John B. McColl of Redding is pioneering legislation along these lines for

State outside the limits of incorporated cities and towns.

MUST PAY FEES

To carry out these purposes the act provides for the regulation and licensing of all persons, firms, or corporations engaged in the business of erecting and maintaining outdoor advertising structures and signs in unincorporated areas and the issuance of licenses and permits upon the payment of specified fees.

The administration of the act is placed



STYLE OF METAL PLATES showing number of permit that must be fastened upon the front of each advertising structure or sign.

California and in many respects it is considered a model law of its kind and a large measure of success is predicted for it. Its basic principles are:

1. That no sign or advertising medium of any kind shall be permitted on the State highway right of way except official direction, warning or information road signs.

2. That no sign or advertising structure shall be permitted adjacent to the highway that constitutes a menace to safe driving by obstructing the vision of drivers.

3. That the law shall provide an exclusive regulation of all advertising structures and signs within view of public highways of the

with the Director of the Department of Public Works, who is empowered to make all necessary orders and regulations for the enforcement thereof and to designate such agents or representatives in the various counties as he deems necessary and proper for the purpose of issuing the licenses and permits. The director is authorized to designate the Maintenance Department of the Division of Highways to enforce the provisions of the act.

LICENSES REQUIRED

Persons, firms or corporations engaged in the business of outdoor advertising as defined in the act must apply for and obtain a license

HOW GORGEOUS SHE BE!

Courtesy of San Francisco Examiner



to conduct such business, and are required to pay an annual license fee of \$50, payable in advance upon the first day of July of each year. Licenses must be renewed annually. When issued subsequent to the first day of July, the fee is apportioned according to the number of months remaining in the year for which the license is issued.

Section 2 of the act provides that certain types of advertising structures and signs are exempt from the provisions of the act, such as official notices, directional signs, real estate signs advertising for sale or lease the property upon which the advertising structure or sign is located, advertising structures or signs used to advertise goods produced or sold upon the property, etc.

No advertising structure or sign not exempt can be erected or maintained within the unincorporated areas of California unless a permit for each such advertising structure or sign is applied for and obtained from the Director of the Department of Public Works.

Permit fees are \$1 for each advertising structure and 25 cents for each sign, payable annually on the first day of January of each year. With each permit there shall be issued

a metal number plate which must be conspicuously fastened upon the front of the advertising structure or sign for which the permit is issued.

It is to be noted that a permit is necessary for each advertising structure or sign not exempted from the provisions of the act, although the person, firm, or corporation erecting or maintaining such advertising structure or sign may not be engaged in the business of outdoor advertising.

Reducing its provisions to concise form the act provides as follows:

Annual license fee of \$50 for carrying on business or occupation of outdoor advertising.
Annual permit fee 25 cents for each sign.
Annual permit fee \$1 each advertising structure.
Permit number and name of owner must be displayed on each sign and structure.

Signs and structures prohibited—general:

- (a) If within highway right of way.
- (b) If imitating warning, stop, or danger signals.
- (c) If in drainage channel.
- (d) If unsafe.
- (e) If with red or blinking light likely to be mistaken for a danger signal.

(Continued on page 29)

3000 Public Works Employees Benefit by Governor's Decree for Full Pay Week

MORE than 3000 per diem employees in the Department of Public Works are being placed on a five-day week basis without reduction in wages.

This was the decision made by Earl Lee Kelly, Director of the Department, following receipt of a letter from Governor James Rolph, Jr., ordering all departments of State government to cooperate 100 per cent with the President of the United States by stimulating employment.

Governor Rolph's letter which lead to Director Kelly's action is reproduced on the adjoining page.

Statisticians of the department are engaged in computing the average weekly earnings of per diem workers for the past year. From these figures will be established the average daily earning of per diem workers and pay schedules will be adjusted accordingly.

It is the intention of the department, says Director Kelly, to play its part in the National Recovery Act by shortening workers' hours without correspondingly decreasing their average weekly wage, to the end that the spending capacity of these 3000 employees may not be impaired and possibly a few additional men employed.

IMMEDIATE COMPLIANCE

"This department will comply immediately with Governor Rolph's request that 'my administration march 100 per cent with the President of the United States in this great offensive against depression'" said Kelly this morning.

"Prior to the passage of Assemblyman Michael Burns' bill calling for a five-day week for per diem workers in the State government," he continued "our maintenance men were working six days per week and our highway shop men five and one half days per week. Under the Governor's orders, with which we are in entire accord in this department, maintenance men will work five days per week at a per diem rate, which will accrue to them approximately the same weekly earning as they have enjoyed in the past. Shop employees will

work five days instead of five and one-half at the same average weekly earning as heretofore."

STRUGGLE FOR MANKIND

"Governor Rolph puts it most aptly in his letter when he says:

"Over this entire nation is sweeping a wave of patriotic fervor, a peace-time wave of unity and accord such as swept us to victory in the World War. In the latter we waged a struggle to the death against mankind. In the former we are waging a struggle to live for mankind."

"We shall proceed to rearrange our working schedule so that it can be put into effect as quickly as possible. Our department will comply with both the spirit and the letter of the law which states: 'in order that available work may be divided among as many employees as is practicable and consistent with State budget limitations and with proper living standards, the five-day week shall be adopted in State employment.

"This department has been bending every effort to relieve the unemployment situation during the past three years by arranging shifts of workers and alternating the shifts to give the greatest spread of employment. That principal will be continued and whenever, through the operation of the five-day week, additional shifts are found necessary to carry on work in progress more men will be given employment.

"The new law also states that it shall be the duty of each department head 'so far as practicable so to arrange and assign the work of his department that the employees therein shall not work more than five days in any calendar week.' From the very nature of our work we will have to make some exceptions in the application of this rule to certain classes of employees.

"It will be necessary for our office and engineering forces who are engaged on matters that deal with going contracts to continue on the regular five and a half or six-day basis as at present but the bulk of our maintenance and shop activities will be put on the five-day basis as soon as the matter can be worked out."

**State of California****GOVERNOR'S OFFICE****SACRAMENTO****AUGUST 4, 1933****JAMES ROLPH, JR.**
GOVERNOR

TO HEADS OF STATE DEPARTMENTS AND THOSE IN
AUTHORITY EMPLOYING STATE EMPLOYEES:

In initiating the five-day week for per diem workers in your department under the terms of the bill of Assemblyman Michael Burns which has now become law, please bear the following thoughts of mine in mind:

I am unalterably opposed to any adjustment of working schedules to meet the terms of the law that will reduce the weekly or monthly wage of the workers. In other words, I do not believe any self-supporting agency, nor any department paid out of the general fund, should arbitrarily reduce the working time of their employees and at the same time arbitrarily force a wage cut upon them—especially where funds are available which make such action unnecessary.

Over this entire nation is sweeping a wave of patriotic fervor, a peacetime wave of unity and accord such as swept us to victory in the World War. In the latter we waged a struggle to the death against Mankind. In the former we are waging a struggle to live for Mankind.

It is my demand that my administration march one hundred per cent with the President of the United States in this great offensive against depression. President Roosevelt asks shorter hours with no reductions in pay so that men may be employed without the purchasing power of the people being impaired. The entire nation is in agreement with him in the belief that if labor is returned to work at an equitable wage, the spending power of the state or nation necessarily will increase and prosperity be returned.

We would not be in step with the great leaders of the nation if we forced our state employees to work less time per week and at the same time took from them part of their earnings which now go for food, clothing and shelter for themselves and their children.

With kind thanks for your immediate cooperation and best personal regards, I am

Very sincerely yours

GOVERNOR

California Sixth in Highway Mileage

(Continued from page 1)

It accomplished the intention of equalizing the Secondary System between the northern and southern groups of counties whereby each group now has approximately 4900 miles.

In 1932 California was second among the States with about \$6,000,000 less than New York in total net receipts of gasoline tax and about 300,000 fewer automobiles and trucks. However, in motor vehicle receipts of \$4.76 per vehicle with a rank of 48th in the States; average gas receipts of \$18.32 with a rank of 39th among the States and average motor and gas receipts together of \$23.09 with a rank of 48th among the States, California now occupies sixth place in total number of miles in the State Highway System and fifteenth place in number of miles of all kinds of roads with a total of 76,964. This compares with Texas occupying first place with 188,539 miles and Rhode Island in last place with only 2739 miles.

The rapid increase in traffic on the highways of California is only second to the rapid growth of our cities and counties. This change during the past five years has developed so quickly that its recognition was the cause of adding mileage to the system and necessarily making radical changes in the legislation controlling the operation, maintenance and construction of our State highways and the activities of the California Highway Commission, Division of Highways and the Department of Public Works.

SUPPORTED LEGISLATION

In making these new laws the members of the State Legislature headed by Senator Arthur H. Breed, recognized as the "Father of Highway Legislation," had the support of the California Highway Commission, who first made the suggestion throughout the State in 1931, the Department of Public Works, the Automobile Club of Southern California, California State Automobile Association, Redwood Empire Association, California State Chamber of Commerce, California State Supervisorial Association, California League of Municipalities and other civic organizations.

In recognizing the fact that while centers of population effect and make necessary the development of highways we must not over-

look the influence of highways upon our governmental, social and community activities. Observance of this effect makes necessary a close study of many factors when considering the inclusion of a new route in our Secondary System.

It is not sufficient that consideration only be given to the relief to counties from high maintenance cost. The planning of a single highway route involves greater thought and effort than one who is not acquainted with the intricate details can realize. Any new route added to the present State system must qualify as follows: first, whether the traffic load demands relief upon the present system; second, is the traffic load on the present county road so great that maintenance costs are so high as to demand relief; third, interstate connections should at all times be provided that the systems of the States may be tied together.

NECESSARY CONSIDERATIONS

Following these basic requirements consideration must be given to the possibilities of the new route. What is its present use, and what are its future possibilities in the interests of trade and commerce? What are the opportunities for tie-in roads to protect land access and what are the possibilities for the best farm-to-market route for the transportation of commodities? What betterment is possible for general transportation so that it will handle to the best advantage through State traffic?

These are economic considerations but thought should also be given to the human factor that enters into highway construction. While modern commercial requirements for speed must be considered, comfort, convenience and safety are of paramount importance. The usefulness of the road which in a large part must be determined by past, present and future demands will control the costs, particular type, location and its eventual life but what are the possibilities for esthetic highway construction and marginal or roadside use? Can residential and commercial structures be controlled in the interests of roadside beautification?

Considerable thought must also be given the new route should its location extend through cities. Some municipalities are of



SIGNING THE NEW DEAL in highway development represented by the Breed Bill adding some 6800 miles to the secondary system. Standing, left to right, W. N. Frickstad, Berkeley; Mayor F. H. Heegler of Vallejo; H. J. Brunnier, California State Automobile Association; Director Earl Lee Kelly; Supervisor J. E. Peyser, San Francisco; Supervisor W. O. Russell, Yolo County. Seated, left to right, Councilman G. W. C. Baker, Los Angeles; Senator Breed; Governor Rolph; Mayor Ament of Berkeley and Mayor F. W. Swanton of Santa Cruz.

the opinion that a State highway should follow their main business street. State highways are constructed fundamentally to handle through State traffic and while planning demands consideration be given local conditions yet the handling of through traffic is the big item.

CITY BODIES CONSULTED

Under the State law highways outside of municipalities can not be less than 80 feet in width. Traffic using a highway where a 30-foot pavement is necessary could not by any logical method or reasoning be dumped into a city where a 40-foot street exists.

While the California Highway Commission under the law can route the highway either through or around a city it has always given consideration to the wishes of the elective body of the city.

Reference was made in the early part of this article to necessary radical changes in the legislation that controls the operation of the Division of Highways. The new bill provides a highway fund in place of the general fund into which was placed money received from the Federal Government to be expended on the Federal Aid System and money received from other sources for special work, particularly from cities and counties; money

segregated into construction, reconstruction and maintenance.

The new law defines maintenance and limits expenditures. Maintenance includes the preservation and keeping of right of ways and each type of roadway, structure and facilities in the safe and usable condition to which it has been improved or constructed.

DISTRIBUTION OF FUNDS

For general administration of the Department of Public Works and the California Highway Commission there can not be spent an amount greater than that derived from one cent per gallon tax on motor vehicle fuel. Provision is also made for the Department of Public Works to spend one-quarter of one cent per gallon of fuel tax, after certain deductions have been made, within the incorporated cities based on population under four alternate methods. Under the bill a more intelligent distribution in the expenditure of the gasoline tax makes it possible for all sections of the State to have an equal opportunity to benefit from the results gained in developing our highway system.

Through a change in the division of the gasoline tax so that now funds can be equally divided between the primary and secondary roads with the privilege of drawing up to 50 per cent of the amount

Piers for Derricks Being Built in Bay

(Continued from page 2)

Francisco-Oakland Bay Bridge, that will rise from the edge of the city's water front.

Two "stiffleg" derricks have been purchased and set up on Pier 24 by Transbay Construction Company for the cofferdam operations.

These great structural steel derricks will drive the interlocking steel sheet piling which will form the wall of the 52 x 122-foot cofferdam.

HUGE CAISSON JOB

Transbay Construction Company are already preparing for their most interesting job—that of sinking the caissons for the deep water piers of the west bay crossing.

For the center anchorage, which we term Pier No. 4, Transbay Construction Company will build four semipermanent concrete caisson style piers to support stiffleg derricks to handle the job of sinking the great 92 x 197-foot caisson into an exact spot in the deep water of the west bay area for the concrete center anchorage.

For Pier No. 6, just west of Yerba Buena Island, heavy timber fenders are now being constructed on Pier 24 to protect the caisson from collision.

Barges will be anchored at the pier site carrying ballast weighing up to 100 tons, and on these barges are mounted "whirleys" for derricks which will operate clamshell dredges, dump buckets, and other devices for concrete pouring and excavating operations.

WORK FOR MINERS

The work on Yerba Buena Island is just now nearing the structural stage.

Clinton Construction Company will be driving piling on the west side of Yerba Buena Island any day now to build a small dock for the purpose of removing earth from the large bore tunnel.

Grouting, the process of forcing high quality cement under pressure into fissures or cracks in the rock of Yerba Buena Island above the tunnel to support the ceiling, will be started before the actual tunneling process.

Hard rock miners will be employed on the tunnel.

In the east bay, Henry J. Kaiser, Incorporated, who will supply ready-mixed



C. H. PURCELL

cement and aggregates to both the Transbay Construction Company, and Bridge Builders, Incorporated, contractors on the entire substructure of the bridge, is constructing a base of operations on Asiatic Wharf which will surpass any similar concrete mixing base built heretofore in California.

LAND PURCHASED

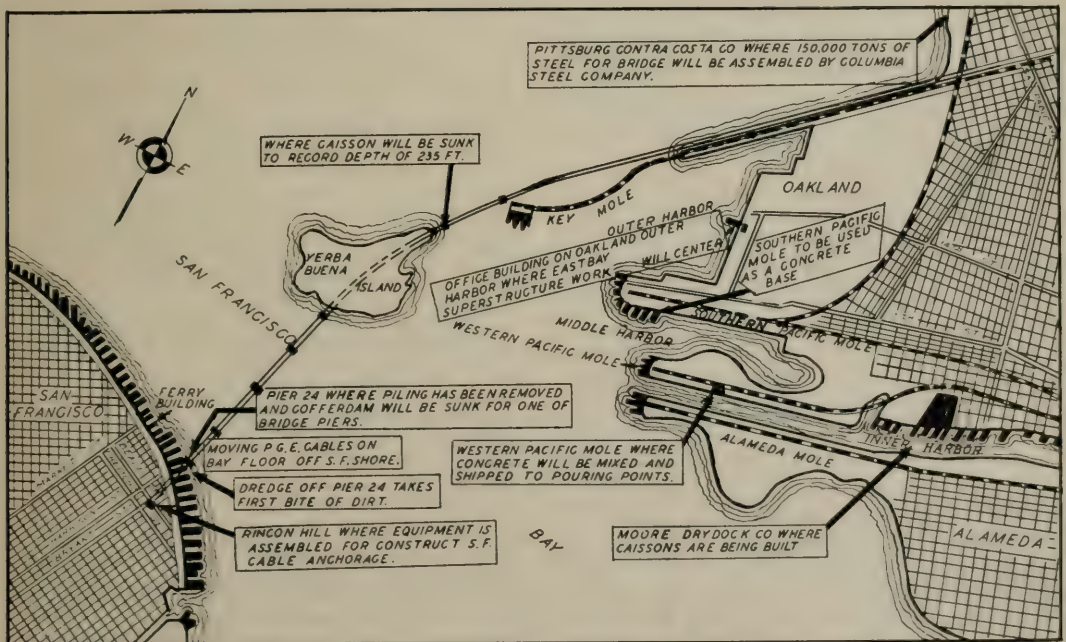
On Rincon Hill in San Francisco excavation is in progress, and the buildings have been wrecked for the San Francisco cable anchorage. This work is being done by Healy-Tibbitts Construction Company.

The first purchase of land by the State of California for the San Francisco-Oakland Bay Bridge was made on the site at Beale and Bryant streets within the past few weeks by our right of way agents.

Interesting work is also in progress at Moore Dry Docks in Alameda County on the steel cutting edges for the caissons of Piers 4 and 6. This construction is proceeding rapidly to hasten deep-water foundations.



FIRST LAUNCHING of a caisson cutting-edge for the Bay Bridge occurred July 26 when the great steel box was floated from Moore's Dry Dock and towed across the Bay to be prepared for sinking.



STRATEGIC POINTS at which fabricating and material plants have been located around the bay for bridge construction purposes are shown in this map. *Courtesy of Pacific Street and Road Builder.*

Probably 100 electric welders are now at work on these huge steel frames which have been compared in appearance to a one-dozen size egg crate with the bottom cut out.

One of these steel cutting edges, made buoyant by timber and compressed air tanks, was launched July 26 and towed across the bay to be turned over to the Transbay Con-

struction Company for the first pier work in the deep water on this bridge. The second will be launched this month.

SAND-HOGS BARRED

The great depth of our piers requires the caisson method of pouring concrete below water and eliminates the employment of "sand-hogs," or underwater pier workmen,

(Continued on page 26)

Main Line Railroad Crossings Eliminated by Two Structures

(Continued from page 4)

to allow industrial development and the necessary spur connections to be made between the railroad and highway.

Probably the most appreciated feature of the new route will be the freedom from main line railroad grade crossings. This will be accomplished by an overhead crossing of the Southern Pacific at the north end of the project near the Standard Oil tank farm, and a subway under the Minkler Spur of the Santa Fe. The result will be a route with no main line grade crossings and but one unimportant spur crossed at grade.

The route usually traveled at present requires the motorist to cross two dangerous main lines of several tracks and spur tracks at three other locations, all sources of delay and potential hazards to life. None of the existing highway route will be abandoned for public use but suitable connections will be provided so that a choice of routes will be available to traffic.

AN UNUSUAL FEATURE

The improvement is being made under two grading contracts, supervised by District VI, and four structure contracts, under the direction of the State Bridge Department. A feature of the project, somewhat unusual, is the construction of the bridges and box culverts before the roadway grading is done. This procedure was adopted to take advantage of the low water during the fall and early winter season and also to use excavated material from the structures to better advantage, thus avoiding excessive borrow. A portion of the material necessary for building embankments is to be secured by grading existing streets to meet the grade of the new highway.

The new Kern River Bridge, two smaller bridges and five box culverts are now practically complete. The large bridge is 2293 feet long, with a 40-foot roadway and two 4-foot sidewalks.

The entire route is to be paved 30 feet wide with asphaltic concrete. The more important street connections are to be paved by the State within the limits of the 110-foot right of way. This wide right of way, provided by the local Acquisition and Improvement Dis-

RESCUE BY HIGHWAY TRUCK IN A DESERT SAND STORM

Department of Public Works,
Division of Highways,
San Bernardino Office.

Gentlemen:

We wish to express our gratitude for service rendered by one of your employees, when we were returning from Boulder Dam.

A few miles east or north of Yermo we encountered a severe sand storm, in the midst of which our engine stalled. After our waiting about thirty minutes one of your trucks came along and towed us to a garage in Yermo.

We feel that only those who have been caught in a desert sand storm can fully appreciate such service as was rendered.

We learned at the above-mentioned garage that the name of our very pleasant and agreeable friend who refused remuneration for this service was Mr. Peacock.

We think the State of California is to be congratulated in having such men in the employ of the Highway Department, and we will be grateful if you will convey the contents of this note to Mr. Peacock.

Sincerely yours,

Mr. and Mrs. W. L. Larry.

trict, is ample for future widening and enlargement of highway capacity and avoids the congestion experienced on the present 60-foot right of way.

TO COST \$693,000

Through the functioning of its Planning Commission, Kern County will exercise control over the location of buildings along the route and road connections to the new highway. By the enforcement of a generous setback provision it will be unnecessary to utilize part of the State right of way for entrance drives.

The entire project, estimated to cost about \$693,000 is expected to be finished by May, 1934. This will be within the period estimated as required for the completion of the relocation and reconstruction of the highway between Los Angeles and Bakersfield including the Ridge Route alternate, which is expected to largely increase the traffic through Bakersfield by reason of the radical improvement in driving time and convenience over the mountain section of this route.

"You say that you are the sole support of a widowed mother, your father having recently been killed in an explosion. How did the explosion happen?"

"Mother says it was too much yeast, but Uncle Jim thinks it was too little sugar."—*Wisconsin Highways*.

Highway Projects Advanced to Bids

The following improvements, with a total cost of approximately \$521,700, were advertised during July or scheduled for advertising during August. The work includes four paving jobs, one bridge, and eight jobs involving miscellaneous improvements, with ten counties sharing in the benefits of the improvements. Bids have been opened on eight jobs with a total cost of \$335,427.34.

DETAILED LIST OF PROJECTS

County	Location	Miles	Type
*Los Angeles	Near Azusa	9.3	Oiled roadbed
*Calaveras	Westerly Boundary to Burson	6.5	Crushed rock surf.
*Marin-Sonoma	Ignacio to Fairville	10.0	Bit. surf.
*San Diego	Broadway to Harasthy St.	1.8	Pavement
*San Diego	Barnett Ave. to Balboa Ave.	4.4	Pavement
*Alameda	Mission San Jose to Warm Springs	1.9	Bit. surf.
*Los Angeles	Palomas Cr. to Whitaker Ridge	6.8	Removing slides
*Los Angeles	Neenach School to Del Sur Road and Wet Canyon to Colby Cr.	25.7	Seal coat. Shoulder oiling
Ventura-Los Angeles	Ventura to Castaic Jct.	40.3	Seal coat on shoulders
Santa Barbara	At Elwood	0.9	Pavement
Los Angeles	Anaheim St. to Slate St.	0.8	Pavement
Inyo	Bishop to Owens R. Canal	3.5	Bit. tr. surf.
Madera	At Ash Slough	646'	timber bridge

SUMMARY

	Miles	Cost
Permanent pavement.....	7.9	\$277,600
Bridges.....	(1)	38,000
Bituminous treated crushed rock surfacing.....	3.5	29,000
Untreated crushed rock surfacing.....	6.5	16,500
Miscellaneous.....	94.0	160,600
Total.....	111.9	\$521,700

NEW TOPOGRAPHIC SHEETS

The final topographic sheets covering Lancaster, Tierra Bonita, Saugus and Newhall quadrangles in Los Angeles County are now available. The survey work was done by the U. S. Geological Survey in cooperation with the county of Los Angeles. The field work was done in 1929 and 1930 and the maps were published on a scale of 1 to 24,000.

BRIDGE BENEFITS VENICE

The ancient, quaint island city of Venice has at last been linked by bridge with the mainland, giving convenient access to automobile travelers while preserving the individuality of the city. The bridge has also greatly aided the prosperity of the city by putting the ancient town in close touch with the modern part of Venice on the mainland.

Hospital Chief Says Improved Highway Has Ended Accidents

By A. D. GRIFFIN, Assistant Office Engineer

ON JUNE 18th I held an interesting conversation with Dr. B. B. Mason, who operates a hospital in Laguna Beach. Dr. Mason stated that since the new highway between Newport Beach and Dana Point had been graded 80 feet wide and paved with 30 feet of portland cement concrete upon new and improved alignment and grades, the serious accidents upon the State highway such as have occurred in the past have practically ceased.

Dr. Mason stated that in practically every case of serious accident on the State highway between Corona Del Mar and Dana Point, he would be called in as the other nearest hospitals are at Newport Beach, Santa Ana and San Clemente and that even if cases were taken to the other hospitals, he usually learned about them.

ONE HOSPITAL CLOSED

He stated that since the highway was first constructed at no time has he been without accident patients in his hospital until the present time, and that he understood that the San Clemente Hospital had been shut down largely because of decrease in their business due to State highway improvements.

When I pressed Dr. Mason for definite figures he stated as follows:

In an average year there would be 30 persons seriously injured in accidents upon the State highway between Corona Del Mar and Dana Point. By seriously injured, the doctor said he meant injuries which laid the victim up several months, often causing permanent crippling and where the bills for medical services and hospital care would run from \$700 to \$1,500.

In a year's time the doctor stated that the minor accidents which would require medical attention and lay up the person injured possibly as much as two or three weeks, would amount to approximately 100. From his knowledge of accidents that have occurred in the past, the doctor stated that the deaths from automobile accidents on the highway would run at least seven per year.

ACCIDENTS OBIATED

He stated that probably the worst condition on the highway before final improvement was at Salt Creek, where, with considerable regularity, two deaths per year had occurred by reason of automobile accidents, with an increasing number of serious and minor injuries.

I questioned the doctor as to the effect of legalizing 4 per cent beer—whether he had noticed any increase in traffic accidents because of intoxication—and he stated that he believed that since the roadbed was now so wide that a slightly intoxicated driver had plenty of room in which to manipulate his vehicle, and also since other drivers had plenty of room in which to avoid accidents, the dangers to the traveling public from intoxicated drivers on this portion of the State highway between Corona Del Mar and Dana Point were entirely obviated.

There were 3,700,000 persons employed in the motor vehicle industry and allied lines last year in the United States.

In Memoriam

ALBURTUS ARIS HOPKINS, father of Harry A. Hopkins, Chairman of the California Highway Commission, died July 16, 1933, at his home in Los Angeles California, at the age of 86 years and 24 days.

He was born on a farm in what is now a part of Terre Haute, Indiana, June 22, 1847. At the age of thirteen years he enlisted as a bugler boy in the Union Army, but was taken out of the army by his father and sent to an uncle in Texas where he again enlisted in the United States Cavalry from Corsicana County, Texas. This was a short enlistment. He again enlisted at Springfield, Illinois, in the 152d Illinois Volunteer Infantry, under then Colonel Adlai Stevenson, who later became Vice President under Grover Cleveland. He served throughout the war, participating in some of the major engagements, as the Battle of Gettysburg, and Pea Ridge, where while on sentry duty, he was wounded by a rifle ball. He took part in Sherman's March to the Sea.

Following the war he served as a government scout under General Crook in the Southwestern Indian Wars, and was mentioned for bravery at the Battle of Ash Hollow, where, under showers of Indian arrows and rifle fire he succeeded in swimming the river and obtaining important information of the Indian strength.

As an early day prospector he had some success in wresting gold from California's mountains.

In the days of stages, he operated and drove stages between Los Angeles, San Diego, Santa Barbara and San Bernardino, San Luis Obispo and Bakersfield.

Of his marriage in Sutter County, California, to Elizabeth Schroeder, who preceded him hence on February 5, 1932, three children survive, being Benjamin F. Hopkins and Ray R. Hopkins of Los Angeles, who are engaged in business there, and Harry A. Hopkins of Taft and Sacramento.

He was an active member of the Odd Fellows, being one of the first members of America Lodge No. 325, and at the time of his death, its oldest member in point of age.

In addition to his three sons and their wives, he leaves three grandchildren, Inez M. Hopkins of Los Angeles, and Harry Hopkins, Jr., and Mrs. Zuvabelle Hopkins Fuller of Taft, as well as one great-grandchild, Lucille Hopkins of Taft.

SINGING VERSUS SNOOZING

Singing is one of various antisnoozing "recipes" suggested for drivers who are inclined to go to sleep at the wheel. "Pull off the highway and take a nap, sing as loudly as possible, or take a cool air tonic by holding the left arm out of the car window," is the advice given drowsy drivers.

The gasoline gauge, defines Robert, is the little "hickey" that points to "half full" when your motor wheezes and dies two miles from a gas station.—*Mississippi Highways*.

Highways Bring Benefits to Railroads

(Continued from page 11)

applicable to either type of highway in favor of one of the other types, the commission is enabled to expend money where need exists. In this connection there are many of our secondary highways that now exceed in importance some of our primary highways and should be developed.

Since 1927 the California Highway Commission has expended nearly \$4,000,000 on city streets in cooperation with the cities out of what was designated the cooperative fund. Nearly all the larger cities and many of the smaller ones have benefited through the use of this fund. Through the application of the one-quarter cent allocated to the cities they will have a freer hand in spending the money in that those cities that have the facilities can spend the money themselves in agreement with the Director of Public Works.

Besides providing for a unified highway system serving equally every part of the State it is said that the new method of operation should result in a saving to local taxpayers both urban and rural in an amount not less than \$7,000,000 annually, and make it possible to further tie together city streets, county roads and State highways in such a manner that their development can be more efficiently carried on.

GREATER USE OF HIGHWAYS

The development of an adequate highway system is brought about through the payment of the service fee on the part of those using the highways. This process of development has never harmed but has ever been the cause of great benefits. The present era in which we live is seeing a greater use of the highways in the United States in the interests of trade and commerce.

This is even so in the face of the effects of our ever changing economic conditions when the present cycle has a tendency to detract from the past conventional methods of transportation. History has repeatedly told the story, "From trail to road—road to rail—rail to highway," and in all this evolution highway transportation can not truthfully be accused of harming any other form of transportation. Even the railroads have benefited in this most modern development of our highway system.

According to J. L. Harrison, Senior Highway Engineer, Bureau of Public Roads, a total of 13,966 miles of pavement were built on the State highway systems of the nation as follows:

9664 miles of concrete pavements.

1161 miles of brick pavements.

749 miles bituminous concrete pavement.

1939 miles bituminous macadam pavement.

1453 miles water bound macadam pavement.

SOURCE OF REVENUE

All this was potentially a source of revenue freight on account of sand, stone, gravel, slag, asphalt base oils, and other materials used in constructing these surfaces. In addition to the above 16,801 miles of gravel and chert surfacing were laid and 3772 miles sand, clay or top soil surfaces. Normally these items do not yield much freight revenue, but drainage structures, bridges, etc., built in connection with these improvements yield a limited amount.

These items represent a total of 60,000,000 tons of aggregate of which 17,000,000 was sand.

A study of 375 Federal aid projects revealed that rails moved cement to 98 per cent of the projects, sand to 74 per cent, and other aggregates 72 per cent. In general 70 per cent of the aggregates used in highway construction during 1931 or 42,000,000 tons was moved by rail.

These facts are pertinent in view of the fact that during the period from 1928 to 1932, forty railroads with 22,417 miles of track and \$1,367,563,225 in bonds and stocks were placed in receivership. During the period from 1892 to 1896, 213 railroads with 56,403 miles of track and \$3,179,201,000 in bonds and stocks were placed in receivership and "there were no busses and trucks in the nineties."

Reference is made to the rails for the reason that the terms of allocation to highway departments of the States under the National Industrial Recovery Act mean so much to the railroads and transportation in having the provision whereby highways can be built to take the place of railroads under certain conditions.

Two New Highway Links Opened and Armory Dedicated at Pomona

By **A. T. RICHARDSON**, Secretary Pomona Chamber of Commerce Road Committee

TWO new sections of secondary State highways totaling more than 12 miles in length and built at a cost of \$572,566 were opened simultaneously July 15 when Governor James Rolph, Jr., officiated at ceremonies held just west of Pomona. Other State, Los Angeles County, Pomona and other city officials participated in the ceremonies which were followed by parades of automobiles over both routes into Pomona and another celebration at the new State armory and municipal patriotic hall.

The two new highways extend westward from the city limits of Pomona, one of them an entirely new route through the hills to Brea Canyon, and the other a realignment of the route through another range of hills to a point near Covina.

The first mentioned of these, known as an extension of Fifth Avenue in Pomona, is a link of State Highway No. 19. Many large fills and cuts, one of the latter being more than 100 feet deep, were involved in construction of this six and two-tenths miles of new highway. It lies almost entirely in the Puente hills and connects with the Brea Canyon secondary highway and also with the extension being built by Los Angeles County to link it eventually with metropolitan Los Angeles.

TWENTY-FOOT PAVEMENT

This new section of State highway No. 19 was built under a \$252,221 contract awarded by the State Department of Public Works. Paved with cement concrete 20 feet wide, with earth shoulders oiled, it was completed and opened to travel at the time of the ceremony July 15.

The other section of highway is six miles of the westerly extension of Holt Avenue, Pomona, past the W. K. Kellogg Institute of Animal Husbandry, a division of the University of California, and through the San Jose hills to Barranca Street, southeast of Covina. The former narrow, twisting hill road was realigned, involving a large amount of grading, and now carries traffic through the hills on easy grades and around curves of not less than 3000-foot radius. It has 30-foot cement

concrete pavement with earth shoulders and it, also, was built under State Department of Public Works contract for \$320,345. It was completed several weeks before the Fifth Avenue section.

It connects with Arroyo Avenue at Barranca Street. Four miles to the west on Arroyo Avenue is the start of another section of new State highway, now nearing completion, which will connect east of El Monte with Garvey Avenue, which extends into Los Angeles.

NEW ERA, SAYS GOVERNOR

Governor Rolph was the guest of honor and principal speaker at the highway opening ceremony held on the Holt Avenue route just west of Pomona and near the Kellogg Institute.

"These two new highways are evidences of progress," said the Governor. "They mean expenditure of money, employment of men, development.

"You can see the tide has turned. We are coming into a new era and you can smile."

Governor Rolph stressed the importance of the two new links in the State Secondary Highway System in southern California in bringing communities closer together and relieving traffic congestion on existing State and county thoroughfares in that section of the State.

RIBBON BARRIERS CUT

At a signal, ribbons stretched across the two new highways were cut, the one across Holt Avenue by Governor Rolph and the other, across Fifth Avenue, several miles away, by Senator Nelson Edwards. Caravans of automobiles which had assembled on the new highways converged on Pomona, paraded through the city and to the new State armory, completed last winter for Company F, California National Guard, and the adjoining structure, Patriotic Hall, just completed by the city of Pomona, where Governor Rolph was given another enthusiastic welcome. He had been given a salute of 19 guns upon his arrival at the point on Holt Avenue

(Continued on page 29)



"THE TIDE HAS TURNED and these new highways are evidence of progress," declared Governor James Rolph, Jr., in dedicating two recently completed projects and an armory at Pomona July 15th. He referred to the extensions of Holt Avenue and Fifth Avenue westward from the city. At top—One of many big cuts on the Fifth Avenue extension, a link of State Highway 19. Left center—Governor Rolph cutting the Holt Avenue barrier surrounded by city and county officials. Right center—State Highway Commissioners Phillip A. Stanton at left and Frank A. Tetley at right assisting Senator Nelson T. Edwards in the official ceremony on the Fifth Avenue link. At bottom—New State Armory for Company F, California National Guard.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
John W. Howe.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

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REDUCES TAXATION

Governor Rolph's signature on the 6800-mile highway bill means savings of millions to taxpayers on assessments in cities and levies in county territories that would ordinarily be paid for maintenance and improvement had these routes not been added to the State highway system.

Now such work on through city streets and connecting county roads added to the system will be paid for from the State highway fund.

In addition the bill provides that one-quarter of one cent out of the three cents tax collected in every gallon of gasoline will be used on main highways through incorporated cities. This is expected to prove of substantial benefit to the municipalities.

The law means also that the State now has a connected network of highways with no "dead ends." State highway mileage has increased from 7320 miles to approximately 13,920. This increased mileage will permit expenditure of highway funds where most needed, requiring also that at least one-quarter of a cent of gas tax money be spent in the maintenance and improvement of through State routes in cities.

It may be noted that the plan for increasing State mileage to provide for more efficient expenditure of funds by spreading them over the more heavily-traveled routes, to bring about an equality of secondary State highway mileage between the north and the south and to permit substantial, local and tax relief had the backing of nearly every county and city government and association.—*Van Nuys News*.

Recently published figures show that flying is decidedly cheaper than it was last year. Evidently the cost of going up is coming down.—*The Humorist*.

Building Executives Confer on Code for Recovery Act Plans

DECISION to formulate a series of codes of ethics and fair competition to regulate the construction and allied industries in every California city under the National Industrial Recovery Act, was reached at a recent meeting of building industry leaders, following a conference with State officials.

The codes are aimed to improve economic conditions in the various units of the construction industry, eliminate bid-peddling and other unfair practices, as well as regulate wage levels and hours of labor, and provide for the ethical conduct of the industry.

VARIOUS GROUPS AT WORK

With National codes for various units of the construction industry being formulated by President Roosevelt's recovery board, it was announced that state-wide, as well as regional codes would be drafted by each branch of the industry, these subordinate codes to be patterned after the National code finally approved by the government, and varying only as local conditions require.

These regional codes will be drafted by the industrial groups in their respective localities, and it was urged at the conference that organization meetings be held in each community by the various crafts and groups to expedite the drafting of codes.

Existing organizations, such as the Associated General Contractors, and the California State Builders Exchanges, are working on the problem, the former already having filed at Washington a proposed National or basic code.

ASSISTANCE PLEDGED

Colonel Carlos W. Huntington, State Registrar of Contractors and a member of Governor Rolph's cabinet, who sponsored the meeting pledged the cooperation of his department in aiding the industry in getting together and formulating a code. He said a skeleton code form would be drafted for the "sole purpose of aiding the various groups in the industry in this important undertaking."

The State Contractors License Act is based upon many of the principles which the President is seeking to establish as a means of stimulating employment and reviving industry, and may be used as a starting point in formulating the State code, it was announced.

Earthquake-Proof Buildings Possible With Right Construction and Materials

By C. H. KROMER, Principal Structural Engineer, Division of Architecture

A study and analysis, "made on the spot," of construction failures due to earthquake shock is presented in the following article by C. H. Kromer, Structural Engineer of the Department of Architecture. As the result of such studies there has been enacted a new State law governing building construction that will make future structure failure and hazard to life exceedingly remote.

AN EARTHQUAKE is a perfectly natural phenomena—just as natural as rainfall, or erosion, or as any of the other marvelous impelling forces that are continuously at work building up, leveling, and equalizing. Earthquakes vary from such slight tremors

as to be hardly perceptible up to the most severe shocks and accompanying destruction. Nor are they exclusively confined to any particular areas. The general impression that they occur in only a few parts of the United States or that severity of damage from them is confined to California is quite erroneous, since there is probably no area where an earthquake has not at some time



C. H. KROMER

been experienced or where it may possibly be felt.

Severe earthquakes have been recorded in the St. Lawrence Valley, in various parts of New England, near New York City, in the Appalachian region from North Carolina to Alabama in the great Mississippi Valley region and many western states. The earthquake of 1811 centering near New Madrid, Missouri, was felt over two-thirds ($\frac{2}{3}$) of the area of the United States.

Earthquake history in California dates back to 1750, or one hundred and eighty-three years. More complete records, however, kept for the northern than for the southern part of the State.

In spite of the gaps in technical knowledge regarding the action of an earthquake shock upon a structure, much progress has

been made and it is possible to so design a structure that it will not fail from shock provided that the structural designer can control the shape and distribution of mass for the various units of the building and provided that the assumed earthquake acceleration is not exceeded.

It is, however, not possible to design a monolithic structure containing various units within itself with different periods of vibration and moments of inertia, especially where the units or elements of the structure form angles with one another so that there will be no crackage at the corners where the two units come together or for example, local failure of relatively low walls connecting with a high massive structure.

The action of an earthquake is that of an oscillating force applied at the base of the structure. The mass and inertia of the structure tend to resist this force. Every structure has a natural vibration period of its own which generally does not coincide with the period of the earthquake.

The earthquake of March 10th in southern California afforded engineers an excellent opportunity to study the various types of construction with relation to their earthquake resistive properties and to analyze the part that improper design and poor or shoddy construction had in the catastrophe.

My observation convinced me that where buildings were properly designed and constructed, using good materials and where competent conscientious workmanship was furnished, that modern American construction stood the test and that buildings as well as bridges and other structures were generally intact but that where the materials entering into the structure were inferior in character and the workmanship shoddy or indifferent or where established principles of good design were violated the structures

(Continued on page 22)

Class "A" Steel Buildings Resist Shock

(Continued from page 21)

were shattered and rendered dangerously unsafe and in all too numerous cases thrown down to the ground.

WITHSTOOD SHOCK

Class "A" buildings of steel frame construction were generally found to be structurally intact except for cracked plaster or tile partitions or for brick tile and filler walls.

These buildings of more pretentious construction, with heavy foundation loads, and of a type of construction regarding which neither owner nor architect were willing to take a chance, necessitated the employment of engineers in their design and of more or less continuous inspection during their construction. As a result they successfully withstood severe earthquake shock while the smaller and simpler types of construction, not having the benefit of this technical supervision, failed.

Class "B" buildings of reinforced concrete construction were properly designed and where the concrete was of good grade, were left in as equally safe condition.

Violations of design, however, were all too prevalent such as lack of lateral bracing or of stiffening walls or struts, lack of knee braces or rigid connections at truss seats or at connections of beams to columns, wall sections too thin or improperly reinforced and with lack of buttresses combined with excessive openings for thickness of wall without compensating provisions.

Cement mortar gave a very good account of itself but was generally lacking. In this connection, two buildings that stood adjacent in a city street were observed. Both were of Class "C" or brick wall and wood floor joist construction. The one, a bank building, with brick walls laid up in very inferior mortar with an almost entire lack of ties had both the front and rear walls badly shattered with portions of these walls down.

Brick work for the other building alongside was laid up in a good grade of cement mortar and, although the roof covering immediately adjacent to the other building had been injured by falling brick from the first building, was practically intact and entirely without crackage of brick work.

POOR MORTAR RESPONSIBLE

Masonry buildings suffered the most from the effects of the shock and it was their failure that occasioned the principal loss of life. Damage was mostly confined to those built of a poor quality of lime mortar or of inferior and shoddy workmanship, and those which took no account of lateral forces in their design or in provisions for bonding and anchoring.

The mortar for all too many of these buildings appeared to be merely dry powder, even lacking properly slaked lime and when cement had been added, the mortar had the appearance of merely being tempered with cement. Header courses were conspicuous by their absence and when provided, were from seven to eight courses apart. Poor mortar, insufficient bonding and the absence of the necessary anchors, contributed in major part to the many failures.

Even when the masonry walls were fairly well

built, they were often battered down by the interior wooden frame, due to the fact that the walls were not properly tied and anchored to the framing. When concrete reinforced bond stone was built continuous around the building at the top of each story height and properly proportioned the masonry was generally intact.

BAD MASONRY WORK

By far the larger number of school buildings were constructed with masonry walls, large inside areas with high walls, as well as with extensive window openings, and with numerous parapets and architectural ornaments. They suffered serious damage not only because of inadequate provision for lateral stresses but in an important degree because of utter lack of competent or efficient workmanship. On the other hand, many masonry walls would have much better withstood the shock if advantage had been taken of cross stud walls by bolting them to the main brick wall, thereby providing lateral support.

Parapet or fire walls were undoubtedly the weakest and most dangerous element of building construction. They should hereafter be entirely eliminated but where architectural requirements control or where they are required by the Board of Fire Underwriters or by local ordinances, they should be so designed and reinforced that they will stay in place during an earthquake.

Face brick and brick veneer on wood studs gave a very bad account of itself due to the lack of ties and header courses. Even where the brick facing was secured to the backing by the customary metal ties, not only did the facing usually fall away from the backing but, in many incidences, the backing also failed. Ordinary brick veneer failures were quite common. On the other hand properly constructed veneering in numerous cases went through the shock without a dislodged brick. I am convinced that this type of construction can be built to stand up under shock only by making the facing integral with the main masonry wall by providing header courses at frequent intervals, or by using more rigid ties closely spaced for brick against wood sheathing and studs.

FELL BY TONS

Face brick fell into the streets by the ton and in other cases was left dangerously buckled. On the other hand, tooth bond in brick work showed failure in every case observed by splitting open at the vertical joint and slipping along the horizontal joint. Walls were observed where this joint slipped and opened three inches or more.

Where joist anchors were not provided or where walls were completely thrown down above the plate line, the joists of floors and roofs slipped off and dropped to the ground or to the floor below or were left supported dangerously close to the edge of the wall.

Steel beams set loosely on top of brick piers or wall corners constituted a very grave menace. These beams should never be thus placed without providing proper lateral support, tying back or anchoring to properly constructed and designed piers.

General Failure of Brick and Hollow Walls Encountered

(Continued from preceding page)

Hollow walls whether of brick or tile proved very unsatisfactory and in general were shattered. Interior walls of the better constructed buildings observed were in major part of tile—both terra cotta and gypsum. The speaker failed to find a single case where they were not cracked and in many cases badly shattered. Brick parapet walls, as well as brick chimneys, were universally thrown down. As a matter of fact all brittle material whether brick, tile, poor concrete or plaster suffered greatly. For the latter material, walls and ceilings were in many cases literally stripped clean to the lath and piled up on the floor. This, of course, was undoubtedly due to lack of keying of mortar to lath, again denoting the lack of good workmanship.

Even for Class "A" construction, the tile walls were badly cracked and in some cases failed locally. It was considerable of a surprise to find that even the exterior reinforced panel brick walls were cracked in numerous places although not seriously yet these buildings except for interior partitions and plaster were not otherwise injured.

HOW BRICK FAILED

Failure of brick walls was generally of the following character:

1. By diagonal crackage or fissures running from near the ground especially in the vicinity of stairways at an angle of about 45° starting at the corners and extending more or less diagonally up to the top of the wall. Buildings were still standing where the fracture was found to be from 1" to 3" in width. This diagonal crackage also occurred at corners of wall openings and was also found to have started at higher levels where the wall was unsupported laterally; for example at about the elevation of the store front spandrel beams.

2. Frequently, especially for the higher buildings of concrete as well as for the brick structures, "X" crackage occurred in the mullions or piers between windows. Another similar phenomena observed—and this was quite typical for the Ocean Center Building, a reinforced concrete structure fourteen stories in height—was in the fissuring of the spandrel between the head of the window for the story below and the sill of the window above.

3. Failure by horizontal slippage of one masonry course on the other, often in a number of different planes for the height of the building. This was frequently accompanied with buckling of the wall and was often severe enough to have caused collapse.

4. Failure by buckling of the wall, due no doubt to alternating points of resistance and weakness in the wall length. As a matter of fact this buckling occurred in both horizontal and vertical planes.

5. Throwing down of parapet walls and chimneys as before mentioned.

6. Failure of brick piers either by shattering, horizontal movement or buckling.

7. General shattering of the masonry.

No building restriction that does not take into account the lateral force (or acceleration) that acts

CITIES SEND THANKS FOR EARTHQUAKE REPAIR AID

The following letters from the cities of Compton and Bell are typical of many received expressing appreciation of the relief extended by the Division of Highways.

CITY OF COMPTON

California

June 23, 1933.

Division of Highways,
Department of Public Works.

Gentlemen:

Your letter of June 21st, addressed to Mr. Dickison, enclosing warrant No. D-22043 in the sum of \$5,308.60, has been received.

I take this opportunity of conveying to you our sincere appreciation of your efforts in this matter. The City of Compton was faced with a very serious financial situation regarding repair of earthquake damage, and with the help received from the Division of Highways we are able to take care of the situation very nicely.

Thanking you for your cooperation, I am

Yours very truly,

J. H. PARK,
City Manager.

CITY OF BELL

California

June 29, 1933.

Division of Highways,
Department of Public Works.

Gentlemen:

The City of Bell extends to you their thanks and hearty appreciation for your cooperation in the adjustment of finances, which adjustment was necessary in view of the recent earthquake.

Your warrant No. E-23068, in the amount of \$735.00, was duly received, and we thank you in addition for the early remittance that made it possible for us to include the same in our annual report as of June 30.

Yours Truly,

E. P. FOLSOM,
City Clerk.

against the structure due to the earth waves that are set up by the initial slippage of the earth will be of avail. It should, therefore, be mandatory that all structures be made earthquake resistive by designing them to withstand a definitely specified lateral force, this force to be dependent upon the character of the foundation soil and upon the height and type of the building.

The problem is complicated by the difficulty of making a rational determination of this force especially in the case of a high building since even more than in the case of a low or so-called rigid construction the structure will rock back and forth during the earthquake motion. Thus the upper portion of the structure does not move with the ground and its acceleration is unknown, so that the forces acting upon it can not be definitely computed. The problem is further complicated owing to the stress

(Continued on page 32)

Bayshore Highway Now Presents a 35 mile Ribbon of 40 foot Pavement

By JNO. H. SKEGGS, District Engineer

THE Division of Highways recently completed another link in the Bayshore Highway leading past the U. S. Naval Dirigible Base near Sunnyvale. The long vision of civic and county leaders is now realized in the completion of this section of the Bayshore Highway, which, with the magnificent Naval Air Base alongside, stands as one of the great monuments to the advancement of the Bay Region.

This newly opened section of the bayshore improvement was accepted by the State June 12th. It extends from Oregon Avenue in Palo Alto to Lawrence Station Road, eight and two-tenths miles (8.2) almost as the crow flies with 40 feet of pavement. The new pavement is bedded on a base course of gravel a foot thick. Oil treated gravel shoulders 10 feet wide provide an overall roadway 60 feet wide.

Such is this latest completed section of the great Bayshore Highway, which now reaches from the heart of San Francisco to many connecting roads in Santa Clara County.

HIGH TYPE SURFACING

From the San Francisco County line to the extremity of this new unit, the distance is 35.08 miles, all of which has been provided with high type surfacing including a small section of three miles at South San Francisco finished and opened July 13.

Structurally the new pavement of Portland cement concrete is placed in two 20-foot lanes; in design, each 20-foot lane is in two 10-foot slabs. As far south as Charleston Road, between Palo Alto and Mountain View, the pavement slabs are 9 inches in thickness for the middle 6 feet, increasing to 11 inches at the edges.

From Charleston Road to Lawrence Station Road, pavement is 8 inches through the middle 6 feet of each slab, thickening to 10 inches at the edges. Of the 8-10 inch pavement, that portion from Whisman Road to Lawrence Station Road has welded wire-mesh type of reinforcement, and the balance of Portland cement concrete has the steel bar type of reinforcement.

On the 8.2 miles of Bayshore Highway

south of Palo Alto, the contractor placed concrete at a rate of approximately 100 cubic yards in finished pavement each hour. On a six-hour day basis, this output produced a section of pavement 20 feet wide, 1033 feet long. This represents an efficiency improvement of about 500 per cent over similar work of 10 or 12 years ago.

At the same time, the present high standard pavement, of which this section is typical, is uniform in character; almost perfectly smooth in surface; and averages nearly 5000 pounds per square inch for compressive strength.

Withal, this high class pavement has been placed with a cost to the State of \$5.90 per cubic yard.

The quality of California State Highway pavement has been improving constantly from year to year, and the cost of its production has steadily declined. This is due primarily to the high development of road building technique growing out of scientific studies and methods of work fostered by the State and carried out by those executing the work under precise specifications. This progression, in turn, is chiefly due to the constant and orderly support of trained State forces and contractors' organizations.

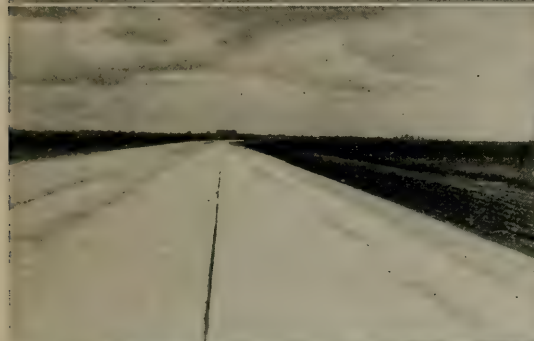
SALIENT FEATURES

Outstanding features of the Bayshore Highway are:

1. Its 125-foot right of way, which guarantees freedom from encroachment.
2. Direct alignment in which curvature is practically negligible.
3. Grades nearly level.
4. Location tributary to and bordering communities whose growth it will serve completely.

These features apply to all of the Bayshore location. This new section, however, has over a mile of frontage along the great Naval Air Base at Sunnyvale, and lies generally on ground high enough for desirable home sites. In all probability, adjacent large holdings will subdivide for homes and small business, as in the case of sections between Redwood City and Palo Alto.

(Continued on page 26)



SPEEDING TRAFFIC on its way to and from the heart of San Francisco along the bay side of the Peninsula, the Bayshore Highway has been lengthened by another link of fine wide concrete pavement extending 82 miles south from Sunnyvale Air Base. At top—Panorama showing the highway and the Navy's great dirigible hangar and airbase city in the background. In center—Typical sections of the four-lane pavement leading past fields and orchards. At bottom—A striking airview that depicts the highway stretching like a long white ribbon across the country past airbase and hangar in the foreground.

Bayshore Highway Aiding in Developing Community Growth

(Continued from page 24)

The general conditions are such that this great arterial will, on the one hand, promote an orderly expansion of community development, and on the other hand remain free from those hampering restrictions which such growth often imposes upon the functions of a trunk-line highway.

Many interesting construction details were carried out in building the high type pavement from the Embarcadero at Palo Alto to Lawrence Station Road. The fact that this entire section was over new rights of way, where soil conditions were not of the best, required careful analysis of materials. A gravel pit was secured, from which most excellent sub-base material was obtained, and a blanket of this material was placed over the marshy ground and adverse adobe soils.

To those who are familiar with the topography and general appearance of this section of the Peninsula, a trip over this splendid new highway brings a thrill of surprise, if not bewilderment.

OPENS NEW VISION

Where a few months ago was grazing land, a magic city now stands—the Naval Air Base of the Pacific Coast. The enormous hangar can be seen for many miles in all directions, and even from San Francisco on a clear day. Adjacent marsh lands and bare grain fields have been transformed into a city of administration buildings, barracks, huge helium gas containers, power plants, machine shops, and scores of other buildings—like another Boulder City grown up over night.

Wonderful and continuous growth for this favored region is no extravagant vision when one sees the transformation already made and under way. In addition, construction of this latest Bayshore section, 8.2 miles long, has provided substantial relief for the burden of unemployment, and has made great advancement toward complete realization of the major objectives of this notable highway.

INVISIBLE

Suave Auto Salesman: It runs so smoothly you can't feel it, so quietly you can't hear it, has such perfect ignition you can't smell it, and as for speed—you can't see it.

Londoner: My word! How do you know the bally thing is there?—*Motor Land.*

Board of Architects Designing Concrete Masses of Bridge

(Continued from page 13)

which is the most hazardous occupation in connection with bridge building.

An important feature of our work is the unification of our designs of huge concrete masses by the Board of Architects, consisting of Timothy L. Pflueger, Arthur Brown, Jr., and John J. Donovan.

The treatment which these architects are designing for the large blocks of concrete that will be visible above water and on land will make this bridge a thing of beauty to the residents of the bay region and those passing over the bridge.

We expect to announce in the near future the designs for these concrete masses.

TOWERS RISE IN 1934

Foundation work will occupy the balance of the year 1933 on this bridge with the exception of the island and anchorage work.

Early in 1934 steel construction on the first towers will be visible on the bay.


These towers will be completed in 1934 and the tremendously interesting task of spinning the cables will begin in 1935 and occupy all of that year until early in 1936.

By the middle of 1936 we estimate all the steel work to be completed, and by January 1, 1937, we expect to have the roadways laid and the bridge ready to be turned over to the California Toll Bridge Authority and opened to the public.

HIGHWAYS

Our State Highway Department has built some of the finest and most scenic highways in the world, and it should be encouraged in every possible manner. Roadways that the people dream of some day having in the middle west, our experts have built here. As little of their money as possible should be diverted away from them.

In Wisconsin they are proud of a mile or two of lakeshore highway at Milwaukee, while here in California we have miles of Pacific coast highway, especially near Santa Monica, Monterey and Santa Cruz. What other people dream of we have already accomplished out here.—*Hayward Review.*



WATER RESOURCES

*Official Report
As Of
August 1, 1933*

EDWARD HYATT, State Engineer

Reductions of budget appropriations have materially affected the activities of this department according to the report of State Engineer Edward Hyatt for July. Cooperative snow surveys have been discontinued and all field and office work under the Sacramento-San Joaquin water supervisor was suspended July 1. Salinity is appearing at lower delta points owing to the decreasing flow of the Sacramento River.

Increasing activity is reported in the financial affairs of the irrigation districts. One district has completed purchase of a private utility system and is able to provide all its own service. Two other districts have perfected plans for refunding over two million dollars worth of outstanding bonds.

Details of dam construction, water distribution and other activities are given in the report as follows:

IRRIGATION DISTRICTS

A digest was prepared of some forty laws, affecting the California irrigation district and similar acts, passed by the 50th session of the Legislature prior to the June recess and approved by the Governor. Increased activity, especially in relation to the financial affairs of irrigation districts, has occupied the attention of the office during the past month.

In connection with information on various matters required by the districts Securities Commission and this office, the following districts were visited: East Contra Costa and Byron-Bethany irrigation districts, East Contra Costa County; Banta-Carbona and Woodbridge irrigation districts, San Joaquin County; West Stanislaus irrigation district, Stanislaus County; Paradise irrigation district, Butte County; Pacheco water district, San Benito County.

The Nevada irrigation district completed the purchase of the Gold Hill system in Placer County from the Pacific Gas and Electric Company and is operating the same. By the acquisition of this system the district is enabled to serve all of its land through its own works.

Plans for refunding the outstanding bonds of the East Contra Costa irrigation district were approved by the commission. The amount involved is \$1,153,000.

The refunding issue of the West Stanislaus irrigation district amounting to \$1,160,000 was approved for certification.

An agreement between the Lindsay-Strathmore and Tulare irrigation districts, Tulare County, stipulating as to water right matters which have been in litigation for many years was approved by the commission.

At request of the directors of the Beaumont irrigation district, Riverside County, an order by the commission consenting to the purchase of water bearing lands and rights was rescinded.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

Routine maintenance has been performed during this period on levees, structures, drains and equipment. Repairs have been completed in the Parks bridge in the Sutter By-pass.

On the East Sutter By-pass levee squirrel and gopher poison is being put out. The operation of the four small pumping plants, has been continued for the irrigation of willows planted for levee protection.

Emergency Flood Protection and Rectification of Rivers.

The camp near Lompoc operated by this Division in cooperation with Santa Barbara County as an unemployment relief project, for the clearing of the channel of the Santa Ynez River, has continued with an average crew of twenty-two men.

Arrangements have been completed for additional bank protection work on the Kelly estate on the Mad River in Humboldt County, to cost \$1,000, and for similar work on the John E. Kane ranch, to cost \$600.

Sacramento Flood Control Project—Construction.

This Division has been requested by the Reclamation Board to construct a water controlling weir in the East Intercepting Canal at Snake River, to cost \$2,675.

Russian River Jetty.

The sum of \$10,000 has been appropriated for additional work on the jetty at the mouth of the Russian River near Jenner, and this sum will be used in the late summer and fall to place additional rock in the jetty. The jetty is in good condition, showing no damage by storms during this period. A small crew has just completed tightening up the cable stays and other parts on the trestle structure.

WATER RIGHTS

Supervision of Appropriation of Water.

Thirty-four applications to appropriate water were received during the month of June, 12 were denied and 17 were approved. During the month 2 permits were revoked and 7 passed to license.

(Continued on page 28)

Snow Survey Activities Discontinued

(Continued from page 27)

Among the permits issued was one to the East Bay Municipal Utility District involving the appropriation of 750 cubic feet per second and 25,000 acre feet per annum on Mokelumne River at Middle Bar Reservoir site for power purposes at an estimated cost of \$800,000.

Mining continues to predominate as the major purpose for which appropriations are being made. During the six month period just closed 60 per cent of the applications received and acted upon were for mining purposes and if there be excepted three or four unusually large appropriations made and permits issued for irrigation and power purposes the amounts appropriated and allowed for mining purposes exceeded the combined appropriations for all other purposes.

ADJUDICATIONS

Shasta River (Siskiyou County). Action by the court on the motion to tax costs is pending the submission of briefs as ordered at the hearing held before the Superior Court at Yreka on April 21, 1933. The time for filing the reply briefs was extended to August 15.

Whitewater River (San Bernardino and Riverside Counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

Eagle Creek (Modoc County). The waters of Eagle Creek were distributed throughout the month in accordance with a schedule of allotments adopted by the water users for the 1933 irrigation season.

South Fork Pit River (Modoc County).—The schedule of allotments adopted by the water users for trial distribution during the 1933 irrigation season was administered by a water master throughout the month.

Deep Creek (Modoc County). The Division's report as referee has been prepared and a proposed decree has been submitted to the attorneys representing the parties in the action.

Franklin Creek (Modoc County). The Division's report as referee and a proposed decree have been prepared. The proposed decree has been submitted to counsel representing the parties involved in the case and no objections have been made within the 30-day period allowed by law.

Pine Creek in Surprise Valley (Modoc County). The waters of Pine Creek in Surprise Valley were distributed throughout the month in accordance with the plan for trial distribution adopted for the 1933 irrigation season.

Cottonwood Creek (Modoc County). The schedule of allotments adopted by the water users for trial distribution during the 1933 irrigation season was administered by a water master throughout the month.

Cedar, Davis, Deep, Emerson, Franklin, Mill, New Pine, Pine, Cottonwood, Owl and Soldier Creeks and South Fork of Pit River (Modoc County). Water master service on these streams was continued throughout the month.

Pit River in Big Valley (Modoc and Lassen Counties). Supervision of diversions from Pit River in Big Valley was continued throughout the month.

Hat, Burney, North Cow, Oak Run and Clover Creeks (Shasta County). Water master service on these streams was continued throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Due to the fact that no provision was made in the Budget for continuation of this work, all field and office activity was practically suspended on July 1st. However, regular salinity sampling in the Delta, the maintenance of Delta tide gages and the maintenance of water stage recorders on return flow measurements in the San Joaquin Valley have been continued in order to obviate a break in the records in the event that an appropriation is made available during the recessed session.

The report of all data and records for the 1932 season has been completed and is being sent out.

Within the past month the flow of the Sacramento River at Sacramento has dropped very rapidly and is now about 3000 second feet and still dropping. Salinity has begun to advance rapidly in upper Suisun Bay and is appearing in channels at the lower point of the Delta. Present stream flow and salinity conditions compare closely with those of 1929. A comparison of the salinity at upper bay and Delta stations on July 6th of this year with that on the same date in 1929, 1931 and 1932 is shown in the following table:

Salinity on July 6th at Upper Bay and Delta Stations in Parts of Chlorine Per 100,000

Stations	1929	1931	1932	1933
Point Orient -----	1680	1770	1180	1560
Bullshead -----	1030	1370	280	780
Bay Point -----	880	---	24	230
O and A Ferry -----	442	870	3	214
Collinsville -----	152	600	1	59
Antioch -----	164	540	1	57
Emmaton -----	20	365	1	5
Jersey -----	10	325	1	9

CALIFORNIA COOPERATIVE SNOW SURVEY

Activity under this project was discontinued on July 1st as no provision was made in the Budget for its continuation. Under the possibility that a small appropriation may be made available to continue the most important features of this work much of the equipment has been left with cooperating agencies and final arrangements with these agencies for complete discontinuance of the work have been held up until it is certain that no further funds will be available.

DAMS

To date there have been received 820 applications for approval of dams built prior to August 14, 1929, of which 690 are now under jurisdiction; 116 appli-

Two New Highway Links Opened and Armory Dedicated

(Continued from page 18)

where he severed the ribbon opening the new route.

Governor Rolph officiated and was the principal speaker at the ceremonies dedicating the new buildings. Clyde E. Houston, president of the Los Angeles County Fair at Pomona, introduced S. V. Cortelyou, State highway engineer, who spoke on the history of Fifth Avenue and what it will mean to the public when extended on into Los Angeles.

OTHER SPEAKERS

Other speakers included Mayor Chauncey C. Perrin, of Pomona; Supervisor Hugh A. Thatcher, Los Angeles County; A. E. Williamson, of the county regional planning commission; P. A. Stanton, Orange County, and Frank A. Tetley, Riverside, State highway commissioners, and others.

Among guests introduced were officials of cities and counties in the vicinity, chamber of commerce representatives and other civic leaders, National Guard officers, and various others.

A dinner and a ball, in which Governor Rolph led the grand march, concluded the festivities.

Law Will Regulate Advertising Signs Along Highways

(Continued from page 7)

Signs and structures prohibited—outside unincorporated areas.

(a) If within 300 feet of intersections.

(b) If obstructing a clear view of approaching vehicles for a distance of 500 feet along the highway.

MISCELLANEOUS PROVISIONS

The law further provides for certain information to be furnished by all applicants for licenses or permits, on forms to be supplied by the Director of the Department of Public Works. No advertising structure or sign may be erected or maintained unless the permission of the owner or lessee of the property upon which the structure or sign is to be located has first been obtained.

The act becomes a law of the State of California on August 21, 1933, and all persons, firms, or corporations coming within the scope of the act must comply with its terms.

Section 16 of the act provides that six months after the effective date of the act, all structures and signs in unincorporated areas of the State of California which have not complied with the terms of the law, become a public nuisance and are to be torn down or removed from the highways.

MAPPING COMPLETED FOR THREE QUADRANGLES

(Continued from preceding page)

cations have been received for approval of plans for construction or enlargement and 384 for approval of plans for repair, alteration or removal.

Twenty-three dams are under construction or enlargement, and 107 are under repair or alteration. Certificates of approval of 580 dams have been issued to date.

Application Received for Construction.

Dam	Owner	County
Desilting Basin No. 6	Cucamonga Basin Protective Association	San Bernardino

Desilting Basin No. 6 Dam is to be an earth and rock fill dam to provide for spreading of flood waters. The State is participating in the costs.

Application Received for Alteration.

Dam	Owner	County
San Andreas	City and County of San Francisco	San Mateo

Plans Approved for Alteration.

Dam	Owner	County
Kincaid	Pacific Gas and Electric Co.	Tuolumne
San Andreas	City and County of San Francisco	San Mateo

TOPOGRAPHIC MAPPING

During the month of June the Sonoma quadrangle in Sonoma County and the Cucamonga quadrangles Nos. 2 and 4 in Riverside County were completed and progress was made toward completing Dixie quadrangle in Lassen and Shasta Counties and Cucamonga quadrangle No. 1 in Riverside County. Control work was carried on in connection with the China Flat quadrangle in Humboldt and Trinity Counties.

The advance sheets of the Kern County quadrangle of the U. S. Geological Survey designated as "North of Oildale" have been published. The area covered is the valley area lying north of Oildale and east of Famoso. The field work was completed in 1932 and the final sheet will be published on a scale of 1:31680.

WATER RESOURCES

South Coastal Basin Investigation.

The budget for this investigation was reduced 60 per cent and about two-thirds of the personnel will be laid off during July and the early part of August. At the present time the force is working on capacity of underground basins.

Triple Celebration Marks Official Opening of Modesto Bridge Project

By R. E. PIERCE, District Engineer

THE completion of the rerouting of the Golden State Highway through the city of Modesto, which eliminates the dangerous Hatch Crossing of a railroad grade, the scene of several fatal accidents—also two other grade crossings was the incentive for a big celebration on the Fourth of July, with the triple purpose of observing Independence Day, dedicating the new Tuolumne River bridge and approaches built by the State and a dam built by the city. The dam was built immediately adjacent to the bridge to form Lake Modesto.

It is estimated that 20,000 people were present at the festivities which opened with a street parade at 10 a.m., led by a horse-drawn coach carrying city and county officials with Governor James Rolph, Jr., seated on the driver's seat.

CEREMONIES ON BRIDGE

Immediately upon the disbanding of the parade, the Governor, city and county officials and the spectators repaired to the new bridge where a platform had been erected and loud speakers installed, that enabled the crowd, which completely filled the bridge from end to end, to hear the speeches.

The principal speakers were Governor Rolph, and two former mayors of Modesto—Sol. P. Elias and L. L. Dennett.

Following Governor Rolph's speech of dedication, the cutting of a ribbon, stretched across the bridge, by four-year-old Sarah Jane Paradis, formally opened the span which is the major feature of the Golden State Highway rerouting through Modesto.

Dedication of Lake Modesto created by the city built dam followed.

The rerouting of the highway through the city, has been the dream of certain public-

spirited citizens of Modesto for years. The question of the rerouting brought on a factional row between a group living on the west side of town, who favored the original routing, and the east siders who favored the Ninth Street rerouting. This was definitely settled by an election, which resulted overwhelmingly in favor of the Ninth Street rerouting.

COOPERATIVE PROJECT

An agreement between the city and the State was entered into, in which the State agreed to build the new bridge and approaches from the south and allocated \$15,000 toward

the paving of Ninth Street. The city agreed to secure all the right of ways inside the city and eventually provide a 76-foot pavement the full length of Ninth Street.

Shortly after the completion of this agreement, the Federal government made available Federal aid money for unemployment relief, and this project being practically ready to go was put under way immediately and construction progressed rapidly.

This project consisted of three parts:

1. The bridge over the Tuolumne River, built under State contract at a cost of about \$245,000. This bridge is 2049½ feet long and is of concrete bent and steel girder construction. It has a concrete deck with a 30-foot roadway and a 5-foot sidewalk on each side. It is built entirely on a curve with a center line radius of 4800 feet. Electroliers have been placed each side of the bridge.

WIDE, PAVED APPROACHES

2. The approach from the south consists of grading and concrete paving for a distance of 7269 feet from Hatch Crossing to



New Tuolumne River Bridge



PATRIOTIC AND INSPIRING was the scene at the dedication of the new bridge over the Tuolumne River at Modesto on the Fourth of July. More than 20,000 citizens turned out to hear Governor Rolph make the official address from a platform erected on the bridge.

the bridge. The pavement is the standard cement concrete 9"-6"-9" section, 30 feet wide, laid in three 10-foot strips. This was built under State contract at a cost of about \$72,300.

3. The work on Ninth Street consisted of laying about 1517 linear feet of asphalt concrete, 30 feet in width or more—487 linear feet at south end of Ninth and 1030 linear feet at the north. The cost of the work was \$10,945.

ROADSIDE IMPROVEMENT CREED

E. Russell Bourne, of New York, in his recently published Creed for Conservation stressing roadside improvement, makes the following points: (1) The appointment of a first-class Landscape Architect to serve on every Highway Commission. (2) The broadening of the Law of Eminent Domain, under which land is condemned by the Highway Commissioner, to permit free purchase of land for highway purposes. (3) Widening of rights of way, known as Freeways, for all main arteries of traffic. (Through State ownership of the right of way, it is proposed to control gas stations, lunch stands, billboards, placement of electric light poles, proper planting of trees, and conservation of trees, and wild flowers.) (4) Planning of roads to increase scenic beauty. (5) By-passes for towns and villages to provide peace, quiet and safety. (6) Parkway development of main arteries of traffic with careful landscaping near cities and preservation of natural beauties outside urban areas. (7) Capitalization of highways as scenic assets of the State and community, to increase real estate values, rather than destroy values.—*Civic Comment.*

High Fuel Tax Cuts Down Registrations

The highest gas tax in the country is reported from an Alabama city which claims 12 cents per gallon from the motorist. The price of gasoline before the tax was 10 cents, according to a recently printed report.

Two States now have a 7-cent gas tax, says the statement, and the Federal Government collects another cent on top of that. Six States levy a 6-cent rate; eight a 5-cent tax; seventeen a rate of 4 cents; twelve, including California, charge 3 cents; while only three States and the District of Columbia charge 2 cents. In every case the Federal tax of 1-cent per gallon is additional.

Three States permit county gas taxes; and five permit municipal gasoline levies added to the State and Federal taxes.

Registration of passenger cars shows the largest decreases in States having 5-, 6-, and 7-cent gasoline taxes.

And now we hear about the street car motorman who, after clanging his bell irately behind an obstinate coal truck for two blocks, finally managed to get up alongside the driver, leaned out his window, and just looked. The truck driver brazenly asks, "Well?" Whereupon the motorman says, "I know what you are. I just want to see what you look like."

Safe Design Must Consider Vibration Point of Building

(Continued from page 23)

conditions that exist especially in a multi-storied frame and to the uncertain resistance offered by walls and partitions.

Consequently, if computations are even to be only approximately correct, the extent and character of this deflection must be calculated.

FLEXIBLE TYPE

Serious question has been raised regarding the flexible first story type of structure. The advocates of this type of construction propose that high buildings be constructed with a very flexible lower story, the idea being that the earthquake motion will be absorbed in this flexible story and that consequently the upper portion of the structure will not be subjected to the full earth acceleration and consequently need not be designed to resist the full lateral force of the earthquake. For this type of construction, however, to be able to withstand earth movement without failure it is necessary that the lower or flexible columns be sufficiently long and slender so that they can deflect the requisite amount without exceeding the elastic limit of the material of which they may be composed and without injury to the auxiliary construction.

This involves a thorough knowledge of elastic frame analysis on the part of the designer and of the forces involved as well as of the precautions that must be taken in order to insure its success. All tall buildings with a high first story tended to act in this manner in the recent earthquake. Due to the relatively great mass of the structure above the first story there is an appreciable lag in the movement of the upper portion with the result that this portion of the structure moves more sluggishly than the ground below and tends to set up an oscillating center near the tops of the first floor columns. In numerous cases observed there was actual failure of the top of these columns since they were too stiff to take the deflection imposed without failure.

FIRST STORY CRACKAGE

While the failure for the lower height buildings was in the nature of a general shattering, for the higher structures the inertia of the upper portion seemed to have set up a resistance to the earth movement which resulted, even for the better constructed buildings, as has before been pointed out, in visible horizontal crackage just below the line of the first floor beams, especially where the columns were of reinforced concrete or of steel fireproofed with concrete. These typical cracks were present at the tops of first story columns at about the line of the construction joints of columns and wall.

This movement was so severe for exterior walls that a number of columns tore loose from the concrete wall panels and spalled off concrete for a length of about three feet at the foot of the columns, exposing the main vertical steel as well as the hooping to the inside face of the vertical rods.

Frame buildings of the floor joist and stud wall constructed type came through the earthquake in excellent condition where properly constructed. This was no different from what was to be expected since experience has shown that this type of construction has proved to be generally satisfactory in earthquake areas.

WHAT CAESAR DID

When Caesar took a westward ride
And grabbed the Gauls for Rome,
What was the first thing that he did
To make them feel at home?
Did he increase the people's loads,
And liberty forbid?
No! he dug in and built good roads—
That's what old Caesar did.

He built good roads from hill to hill,
Good roads from vale to vale,
He ran a good-roads movement
Till Rome got all the kale;
He told the folks to buy a home,
Built roads their ruts to rid,
Until all the roads led up to Rome—
That's what old Caesar did.

If any town would make itself
The center of the map,
Where folks will come and settle down
And live in plenty's lap;
If any town its own abodes
Of poverty would rid,
Let it go out and build good roads—
Just as old Caesar did.

—From *Kansas City Journal-Post*.

With particular reference to the elimination of injury from earthquake, the above concepts are not so difficult of attainment as might generally be supposed. The principles involved are comparatively simple in themselves and briefly stated, the result desired may be obtained in design and construction by paying attention to the shape of the building so that the natural period of vibration is at not too great a variance for the different portions and that the shape of the structure be such as to be most easily adaptable to symmetrical bracing and of more or less equal strength about the center of mass of the structure, especially by avoiding the use of irregular or angular shapes with various masses and period of vibration, and by rigidity of construction.

As regards actual details of construction, the kind of material is not nearly so important as that it be of good quality; that the workmanship be competent, conscientious and thorough; and that the intent of the design be intelligently complied with. If these fundamental concepts are followed and safety of construction rather than its cheapness be the primary consideration, then the earthquake hazard, will be exceedingly remote, at least as far as the risk to life is concerned. Already such progress is being made that we can be encouraged to hope and in fact, can be confident that the hazard from earthquake will be gradually eliminated by building more safely in the future as well as by the gradual deterioration and removal of such existing structures as may now be unsafe.

CONNER QUADRANGLE COMPLETED

The final published sheet of Conner Quadrangle, Fresno County, has recently made its appearance. The scale is 1:31,680 and the contour interval is 5 feet. The surveys were made by the Topographic Branch of the U. S. Geological Survey cooperating with the State of California and the State Engineer's office. Copies may be obtained through the superintendent of Documents, Washington, D. C.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor

EARL LEE KELLY-----Director

ERIC CULLENWARD-----Deputy Director

MORGAN KEATON-----Assistant Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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PHILIP A. STANTON, Anaheim

FRANK A. TETLEY, Riverside

DR. W. W. BARHAM, Yreka

C. H. PURCELL, State Highway Engineer, Sacramento

JOHN W. HOWE, Secretary

HUGH K. McKEVITT, Attorney, San Francisco

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L. V. CAMPBELL, Office Engineer

T. E. STANTON, Materials and Research Engineer

FRED J. GRUMM, Engineer of Surveys and Plans

C. S. POPE, Construction Engineer

T. H. DENNIS, Maintenance Engineer

F. W. PANHORST, Acting Bridge Engineer

R. H. STALNAKER, Equipment Engineer

E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding

CHARLES H. WHITMORE, District III, Sacramento

J. H. SKEGGS, District IV, San Francisco

L. H. GIBSON, District V, San Luis Obispo

E. E. WALLACE, District VI, Fresno

S. V. CORTELYOU, District VII, Los Angeles

E. Q. SULLIVAN, District VIII, San Bernardino

J. W. VICKREY (Acting), District IX, Bishop

R. E. PIERCE, District X, Sacramento

General Headquarters, Public Works Building,
Eleventh and P Streets, Sacramento, California

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A. D. EDMONSTON, Deputy in Charge Water
Resources Investigation

R. L. JONES, Deputy in Charge Flood Control and
Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams

SPENCER BURROUGHS, Attorney

EVERETT N. BRYAN, Hydraulic Engineer, Water
Rights

A. N. BURCH, Irrigation Investigations

H. M. STAFFORD, Sacramento-San Joaquin Water
Supervisor

GORDON ZANDER, Adjudication, Water Distribution

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C. H. KROMER, Principal Structural Engineer

CARLETON PIERSON, Supervising Specification
Writer

J. W. DUTTON, Principal Engineer, General Con-
struction

W. H. ROCKINGHAM, Principal Mechanical and
Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief

FRANK B. DURKEE, General Right of Way Agent

C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor

Port of San Jose—Not appointed

Port of San Diego—Edwin P. Sample

O R E G O N

CENTRAL VALLEY PROJECT OF STATE WATER PLAN

Scale of Miles
0 20 40 60 80



CALIFORNIA HIGHWAYS AND PUBLIC WORKS

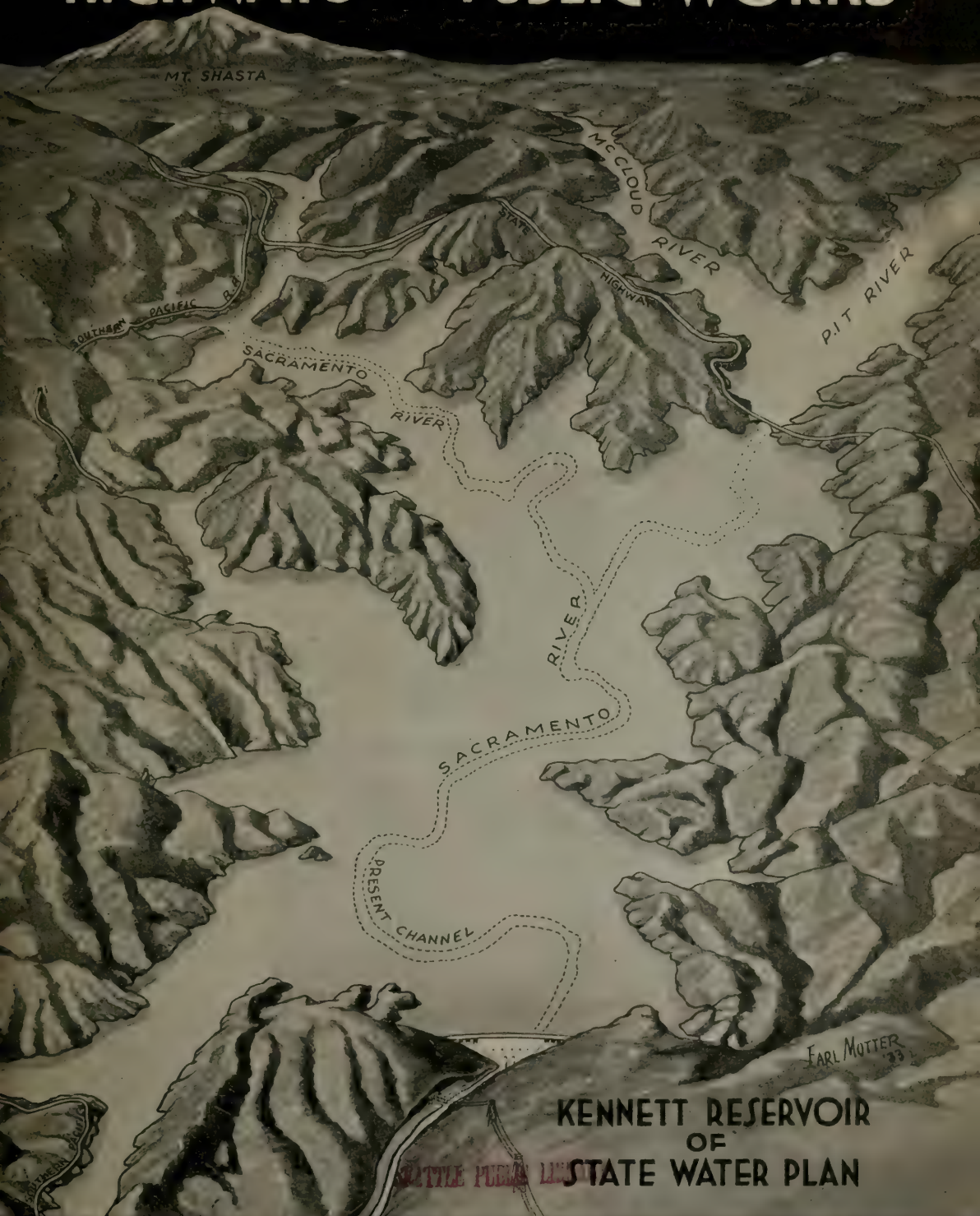



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"50,000 Men at Work by Christmas!" is Highway Division Speed-up Slogan

Bids opened for 50 Projects as first installment of Construction Program under Biennial Budget allotment of \$34,352,438 for jobs in 52 out of 58 Counties

By **ERIC CULLENWARD**, Deputy Director of Public Works

FIFTY thousand men in the "trenches" by Christmas—

Taking liberties with the old cry of the World War, the above is the slogan of the Department of Public Works from now until the festive season.

The "trenches" in this case may amply be considered the highway system of the State of California upon which some thirty-four millions of dollars is to be spent during this biennium on new construction.

With announcement of the budget for this period made August 17th allocating funds for projects in fifty-two of the fifty-eight counties throughout the State, speed has been the order of the day in the Department of Public Works.

Spurred on by repeated orders of Governor James Rolph, Jr., that men be put to work as fast as possible in conformity with the NRA and in an effort on his part to relieve distress and suffering in California, double shifts of specification writers, draftsmen and engineers have launched on a mammoth highway construction program.

With the wholehearted assistance of the State Printing Plant whose employees worked overtime on Saturdays and Sundays, specifications for fifty projects throughout the State were completed in record time for

advertising on August 25th, and on September 13th, 14th and 15th, bids totaling \$3,417,448 were opened at Sacramento for 41 projects, the remainder of the fifty being opened in several district headquarters.

Approximately two million dollars worth of additional projects were planned the following week and from that time on until Christmas it is the hope of the Department that one million dollars worth of projects

per week will be advertised so that by Christmas fifty thousand men will be employed directly or indirectly on construction work throughout the State and in the preparation of materials and machinery used in such work.



ERIC CULLENWARD

In all, \$70,136,000 will be expended by the Department of Public Works under Director Earl Lee Kelly in the 85th-86th biennium ending June 30, 1935.

This sum is the total of all State highway revenues to be received from all

sources and includes the Department's share of the Motor Vehicle Fuel Tax, Motor Vehicle Registration Fees, Motor Bus Franchise Tax and Federal appropriations. The latter consist of California's allotment of National Recovery Act Fund totaling \$15,607,354. The counties' share of Motor Vehicle Fuel Tax is not included in the figures given above.

(Continued on page 6)

Governor Signs Water Bill to Obtain N. R. A. Millions and Work for 25,000



ON August 5, 1933, Governor James Rolph, Jr., affixed his signature to Assembly Bill No. 259, providing for the construction, operation and maintenance of the Central Valley Project of the State Water Plan. This official act of the Governor marked the culmination of ten years of effort to enact legislation which would provide for the construction of a first unit of the State Water Plan. It carried into effect the policy enunciated by the Governor in his inaugural address, wherein he declared:

"A coordinated solution of these problems has long and earnestly been sought. Surely, in California, where water is so precious, the State must devise a general unified plan for the conservation and use of its water against the increasing needs of its increasing population and the demands of the coming generations whose stewards we are * * *. I stand ready as Governor to give the Legislature and the distressed localities all the assistance in my power toward finding a practicable solution of these pressing problems."

Further, it brought to fruition investigations started some 60 years ago during the administration of Governor Newton Booth.

SPEAKERS COMMEND GOVERNOR

A large gathering of friends of the measure including legislators and State officials was present in the Governor's Council Chamber to witness the signing of this bill. Senator Bradford S. Crittenden, who has been a leader in water conservation matters for many years and has served as chairman of each interim legislative water committee, acted as master of ceremonies. Many legislators and other proponents of the measure present strongly endorsed the bill and commended the Governor for his staunch support of water conservation and development and of this legislation in particular.

Among those who spoke were Senator James I. Wagy of Kern County; Senator John B. McCall of Shasta County; Assemblyman Clifford C. Anglim, Contra Costa County; Francis Carr and Jesse Poundstone, members of the Governor's Water Commission; Van

Bernard, former member of a Legislative Water Committee and Harry Barnes, secretary of Madera Irrigation District.

In appreciation of his continued and tireless support of the State water program, the Governor was presented with a token in form of a beautiful silver vase. The presentation speech was ably made by Harry Crowe of Tulare County.

Among the State officials present were Earl Lee Kelly, Director of Public Works; Timothy Reardon, Chief of Bureau of Industrial Relations; Ray L. Riley, State Controller; Harry L. Hopkins, Chairman of State Highway Commission and Edward Hyatt, State Engineer, Colonel Robert B. Marshall, father of the "Marshall Plan" and Assemblyman Rodney L. Turner, one of the authors of the bill also were present.

MANY OFFICIALS PRESENT

In signing the act, the Governor stated, "This act provides the possible means of obtaining a 30 per cent grant under the N. I. R. A., amounting to 40 or 50 millions of dollars which would make the project self-supporting from water and power revenues alone. The construction of this project would provide, directly and indirectly, employment for 25,000 men for four years and would solve the water problems so serious in the Sacramento and San Joaquin valleys, for many years to come. It is a project which should be consummated at the earliest possible moment because of its great merit and its great public advantages."

Assembly Bill No. 259 will permit the State to avail itself of the opportunity to finance the Central Valley Project under the provisions of the National Industrial Recovery Act. It embodies provisions recommended by Henry T. Hunt, general counsel of the Public Works Administration, to a committee sent to Washington, D. C., by Governor Rolph in May, 1933, for the purpose of conferring with the Federal agencies and California's representatives in Congress in regard to furthering the water project before the Federal Government. The personnel of the committee was



MILLIONS FOR EMPLOYMENT were made possible by Governor Rolph's signature affixed to Assembly Bill No. 239 on August 5th, providing for construction of the Great Central Valley Project of the State Water Plan involving a system of dams, canals and conduits for conserving and distributing water and manufacturing power. In the group watching Governor Rolph sign are: standing, left to right, Stanley Abel, Kern County supervisor and W. J. Buchanan, Contra Costa supervisor, respectively secretary and president of the California Supervisors Association; Former Assemblyman R. P. Easley, member Joint Legislative Water Committee; Francis Carr, member California Water Resources Commission; Col. R. B. Marshall, originator of first State Water Plan; Senator B. S. Crittenden, chairman Joint Legislative Water Committee and a sponsor of the bill; Assemblymen C. C. Anglim and Rodney Turner, authors of the bill; State Engineer Edward Hyatt; Jesse Poundstone, member California Water Resources Commission. Seated, left to right, Earl Lee Kelly, Director of Public Works; R. E. Collins, chairman, State Board of Equalization; Senator John B. McColl, a sponsor of the bill; Governor James Rolph, Jr., and Senator J. B. Waggy, a sponsor of the bill.

Edward Hyatt, Chairman, P. D. Nowell, Thomas M. Carlson and Clifford C. Anglim. The bill embodies the fundamental principles contained in Assembly Constitutional Amendment No. 18, approved by the Legislature May 5, 1933, which contains the recommendations of the Joint Legislative Water Committee and of the Governor's Water Commission relative to the State embarking on a State water program.

NO STATE LIABILITY

It is a revenue bond act patterned, particularly in its fiscal features, after the California Toll Bridge Authority Act under which construction of the \$75,000,000 San Francisco-Oakland Bay Bridge is being successfully prosecuted, and after laws under which many interstate public projects costing in excess of \$100,000,000 in New York and New Jersey have been carried out by the Port of New York Authority.

It creates no State liability. Costs of the project would be paid entirely from revenues.

A vote of the people is not required to approve this measure and it will become a law on October 25, 1933, unless those seeking to defeat the project secure sufficient signatures to qualify a referendum petition prior to that date.

The salient features of the act (Chapter 1042, Statutes of 1933) may be summarized as follows:

Creates Project Authority. A governmental agency is created to administer the act to be known as the Water Project Authority, composed of the Director of Public Works, the Director of Finance, the Attorney General, the State Controller and the State Treasurer. The Director of Public Works is designated as the chairman and the State Engineer as the executive officer of the Authority.

Construction of Central Valley Project Authorized. The Authority is authorized and empowered to proceed to construct the Central Valley Project when, in its judgment, income and revenue from all sources will be adequate to pay all costs of the project, including bond redemption, interest, operation and maintenance, and the Authority is directed to proceed with such construction immediately upon funds becoming available therefor.

Enumeration of Units. The Central Valley Project comprises the following units:

- (a) Kennett dam and reservoir on the Sacramento River, with hydroelectric power plants and a main power transmission line to a central substation near the city of Antioch.
- (b) Contra Costa Conduit extending from the San Joaquin Delta to Martinez.
- (c) San Joaquin Pumping System extending from the delta to Mendota (construction of this unit may be deferred).

(Continued on page 12)

Death Valley Roads Taken Into State System Provide 223 Mile Loop Tour

By J. W. VICKREY, Acting District Engineer

INCLUDED in the 6800 miles of secondary roads recently taken into the State Highway System are the two main entrances to Death Valley—one via Baker and Death Valley Junction, and the other via Lone Pine and Darwin. In reality, the road forms a 223-mile loop from Route 23 at Lone Pine to Route 31 at Baker, with a connection to the State line from Death Valley Junction.

Thirty miles of the road, from the westerly side of Panamint Valley to the sea level contour near Stove Pipe Wells Hotel, is a toll road, and 25 miles across the floor of Death Valley proper is below sea level.

The area traversed is very dry and barren. While the summit of the Inyo mountains is 5300 feet, and Townsend Pass in the Panamint Range is 5200 feet above sea level, the entire area lies well to the east of the Sierra Nevada, and the moisture laden clouds from the west are stripped or entirely dispersed before reaching this area during the winter storm periods. The Valley of the Colorado is the only channel through which vaporized ocean water reaches this high desert country. This probably accounts for whatever winter rainstorms occur.

MENACED BY CLOUDBURST

A considerable portion of the present road lies along the edge or bottom of creek beds, where it is subject to obliteration by flood water with only an instant's warning, the cloudburst causing the flood having occurred several miles away. Portions lie along the foot of, or across, cloudburst fans, conglomerate masses of rock and debris deposited at the mouth of the canyons, where the flow slackens, and the water spreads and evaporates, or sinks into the sand. Some of these fans reach for a thousand feet up the mountainside, and spread out to miles in length, where they intersect the floor of the valley.

It taxes the imagination to conceive of the force which formed them, but it is not hard to imagine what happens to the road when the cloudburst occurs.

Across the floor of the valley, near the north entrance, the road lies in the path of shifting

sand dunes, and further south, across salt marshes, where it may be that the maintenance man will find the cure for the ever present dust. In all, the road presents a very uninviting, but interesting, problem for the highway engineer.

HIGHEST SHEER PEAK

The whole floor of the valley, comprising some four hundred square miles, is below sea level. The lowest point is —310 feet (estimated) at Bad Water, near the southern end. The sea level contour encloses an area more than 70 miles long, and from 1 to 6 miles wide. Telescope Peak, in the Panamint Range, rises 11,045 feet above sea level, and towers above the land at its foot, as does no other peak in the United States. Its full height, starting from the plain below sea level, is visible, while Mt. Whitney, more than 3000 feet higher, rises from a plateau almost 4000 feet in elevation, and is less imposing because of its rival neighbors.

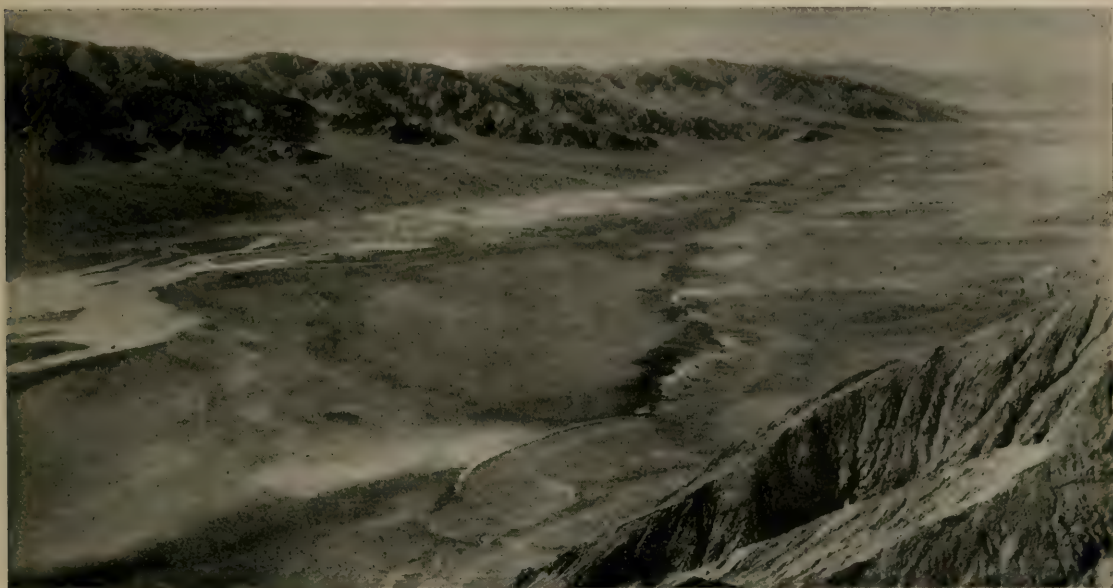
The valley received its ominous name from one, Lewis Manly, who, early in 1850, led the remnants of the "Jayhawker" emigrant train out of the valley, over the Panamint Range to the south of Telescope Peak. They paused long enough on the ridge overlooking the scene of so much trial, suffering and death, to bid farewell to "Death Valley."

While the definite record of the valley begins with these emigrants who wandered into it from the Old Spanish Trail, there is no continuous, accurate record, even of the actual climatic conditions, all the available information coming from various sources. There is no doubt, however, but that the summer climate will satisfy even the most ardent lover of warm weather; a temperature of 134° in the shade has been recorded at Furnace Creek Ranch, that being the limit of the thermometer.

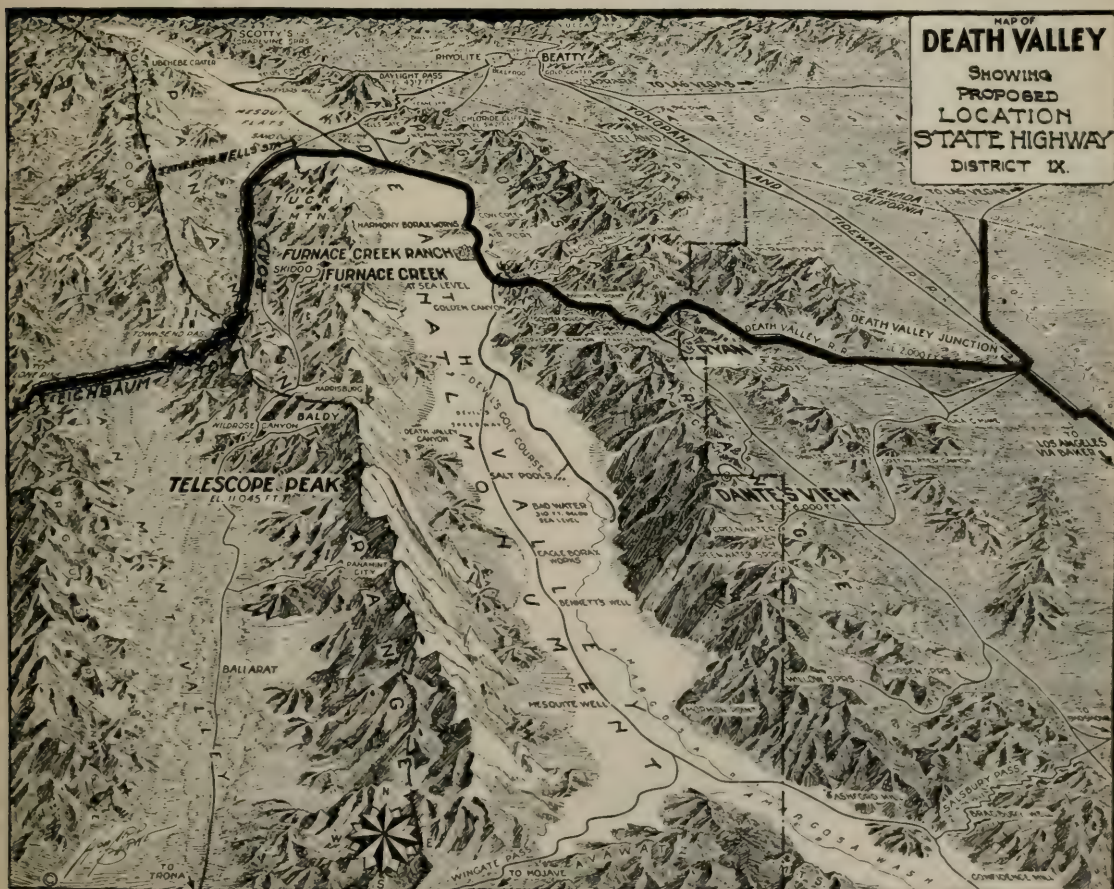
EXTREME TEMPERATURES

Geological Survey documents suggest a temperature of 150° around the stone beds at the mouths of the canyons, and one writer has guessed that out on the salt beds the heat will go to 160°. Considered from the real estate promoter's viewpoint, the annual

(Continued on page 8)



INTO THE JAWS OF DEATH rode the ill-fated Jayhawker party of pioneer emigrants who tried to cross this great arid sink in 1850 and the survivors named it Death Valley.



Drawn and copyrighted by Howard Burke.

DEATH VALLEY LOOP route taken into State's Secondary System is shown in this sketch.

“Speed-up” Campaign Begun on Bids

(Continued from page 1)

This budget provides for general administration, engineering, rights of way, maintenance, construction and reconstruction necessary for the upkeep and improvement of the State Highway System which now approximates 14,150 miles. It provides for allocations to joint highway districts and the allotment of one-quarter cent per gallon fuel tax for expenditures within the incorporated cities of the State.

This budget, which has received the approval of the Governor, is the result of many weeks of intensive study by the State Highway Commission and the heads of the Department of Public Works. The Commission, Harry A. Hopkins, chairman, Taft; Timothy A. Rear-don, San Francisco; Phillip A. Stanton, Anaheim; Frank A. Tetley, Riverside; and Dr. W. W. Barham, Yreka, sitting with Earl Lee Kelly, Director of the Department of Public Works, held innumerable open meetings and their budget has been drawn to care for the relief of unemployment and the traffic needs of the counties as co-related to the general highway system of the State as a whole.

A DIFFICULT TASK

It was no mean task for the Highway Commission to allocate the \$34,352,438 for new construction and reconstruction work. Every community had its pet project and the budget is the result of the sifting of many, many proposals until a program was reached by the Commission which it felt would serve the needs of communities and at the same time advance the State Highway System as a whole.

With the budget signed, sealed and delivered, the opening gun was then fired in this program of road building and employment by Earl Lee Kelly. A “speed-up” order rivaling those being sent out at intervals from Washington was issued following a joint conference between the Director and C. H. Purcell, State Highway Engineer, and things began to hum in the Division of Highways.

Included in the \$34,352,438 for this new construction and reconstruction is the Federal appropriation of nearly \$16,000,000 allocating 25 per cent for extension of Federal-aid high-

ways within municipalities; an additional 25 per cent on feeder roads; and the remainder for work upon the Federal Aid System outside cities. This money, in conformity with the terms of the Federal act, is being spent in at least 75 per cent of all counties of the State.

MOST COUNTIES PARTICIPATE

Major construction allocation provides projects in 89 per cent of the counties, while maintenance and minor improvements cover all the counties.

Commenting upon the “burning of midnight oil” in the Division of Highways, Director Kelly said:

“I have received orders from Governor Rolph to proceed with construction work at the earliest possible moment, since it is the Governor’s desire to aid in the Nation’s recovery by putting the maximum number of men to work as quickly as feasible.

Legislative limitations prevented us from sending out specifications before August 21st. Therefore, it will be at least October 1st before actual work is done on any of our projects. However, we are rushing our plans and the State will see a beehive of activity on our highway system within the next few months.”

“The budget moneys have been allocated primarily to advance the California Highway System as a whole, rather than in an effort to favor any particular locality,” said Harry A. Hopkins, Chairman of the Commission. “We have almost doubled the highway system of the State, and it has been a big task to coordinate our allocations with the new needs attendant upon the inclusion of some 6800 miles of county roads into our system, but every allotment we have made has been based upon a desire to maintain the efficiency of our State Highway System to improve it so as best to serve all the people of the State.”

A list of projects comprising the major construction items in the new budget follows. The list shows the counties in which the work will be done, the estimated cost of each improvement and its approximate location. More definite details of routing, alignment, type and standards of construction will be available after final engineering surveys and plans are completed.

List of Highway Budget Projects

(Continued from preceding page)

County	Route	Location	Mileage	Nature of Improvement	Amount
Alameda	5	San Francisco Bay Bridge			
	14	approaches		Grading paving, structures	\$1,650,000
	5	Oakland to 1.5 miles south	1.3	Grading, paving, bridge (see City Project's)	54,300
	75	Oakland Tunnel (portions)		Grading, tunnel	50,000
	14	Albany, San Pablo Ave.		Widening and paving	79,400
	14	Berkeley, San Pablo Ave.		Widening and paving	63,600
	14	El Cerrito, San Pablo Ave.		Widening and paving	118,670
	14	Oakland-Emeryville, San Pablo Ave.		Widening	41,500
	5	Oakland, Moss Ave.		Webster Street to Santa Clara and Harrison	96,300
	5	Oakland, Foothill Blvd.		South entrance (see item 11 above)	50,000
				Total, Alameda County	\$2,203,770
Alpine	23	Centerville to Markleeville	6.6	Grading, surfacing, bridge	\$230,000
				Total, Alpine County	\$230,000
Amador	34	4 mi. west to $\frac{1}{2}$ mi. west Pine Grove	3.5	Grading, oil surface	\$70,000
				Total, Amador County	\$70,000
Butte	21	Prison labor camps (primary)		Grading	\$670,000
	21	Oroville to Quincy (portions)		Grading	183,200
	3	Pine Creek Bridge and approach		Bridge, grading, paving	25,300
				Total, Butte County	\$878,500
Calaveras	65	San Andreas to Angels (portions)	9.4	Grading, surfacing, bridges	\$105,000
				Total, Calaveras County	\$105,000
Colusa	7	Maxwell to northerly boundary (portions)		Grading, paving, bridges	\$280,000
	50	Rumsey to Route 15 (portions)		Grading, bridge	87,500
				Total, Colusa County	\$367,500
Contra Costa	14	San Pablo to Crockett (portions)	1.4	Paving	\$42,500
	75	Oakland Tunnel (portions)		Grading, tunnel	50,000
				Total, Contra Costa County	\$92,500
Del Norte	1	Last Chance Slide to Flannigans	9.2	Grading and surfacing	\$595,000
				Total, Del Norte County	\$595,000
El Dorado	11	Kyburz to Strawberry	9.0	Surfacing	\$115,000
	65	Greenwood Creek and approaches		Bridge, grading	7,500
				Total, El Dorado County	\$122,500
Fresno	41	Prison labor camps (secondary)		Grading	\$490,000
	4	Selma to Fowler Switch Canal	1.8	Grading, paving	85,300
	4	Fresno, Broadway		El Dorado to Tulare and Cherry Ave. to Broadway	103,044
				Total, Fresno County	\$678,344
Humboldt	1	Benbow to 7 mi. north of Garberville	7.5	Grading, surfacing and bridges	\$575,800
	1	Smith Ranch to Twin Trees	0.7	Bridge, grading, surfacing	116,300

(Continued on page 28)

Death Valley to be Made Accessible by New State Highways

(Continued from page 4)

average of 75.6° indicates a very delightful climate; but in computing this average, the extremes of 15° and 134° must be considered, as well as the average of one record for July, both nights and days, of 101.2° .

Following the Emigrants in 1849, prospectors were lured into the ranges surrounding the valley by stories of gold, silver and lead deposits, the wealth of which would stagger the imagination, and while such deposits are still missing, and still sought for to some extent, the prospecting did lead to the discovery of borax deposits, which brought about the construction of wagon roads or trails, a railroad and the gradual development of the area to its present status.

There are several so-called roads throughout the valley that can be traveled during the cooler months, and when the cloudbursts have not removed all trace, since in the majority they follow the bottom of the washes, that being the most accessible location. The railroad, however, has been abandoned, as well as the 30 miles of monorail that was constructed by mining interests to the southern end of the valley.

Neither the prospectors nor the later developers, however, have been able to locate more than meager supplies of water suitable for men and radiators, and the visitor is advised to carry his own.

The area comprising most of the valley, to the summits of the bordering ranges, was included in the Death Valley National Monument early in 1933, and the United States National Park Service is turning attention to the proper development of the valley so as to preserve, and at the same time render more accessible, its unique attractions. This attention on their part, together with the gradual improvement of the approach roads, will no doubt attract more and more visitors to this at present isolated area, the many wonders of which will excite the imagination of even the most casual observer.

"I shouldn't think you'd let your wife drive the car downtown alone. She doesn't know the traffic regulations, does she?"

"No, but she's young, and good looking."—*National Highways*.

Two Big Snow Plows Built in State Shops Exhibited at the Fair

APPLYING the knowledge accumulated during the past two winters in keeping California's main highways open through the high Sierra passes equipment engineers of the Division of Highways have redesigned and rebuilt at headquarters shop two types of snow plows that are expected to swiftly annihilate the deepest drifts old Boreas can pile up against them.

The machines are the most powerful yet designed for snow work. The larger is a huge railroad type rotary. The business end of it suggests a gargantuan demon with bat ears and a great gaping maw full of whirling steel blades for teeth.

The rotor wheel is driven by a Liberty aviation engine developing 420 horsepower at 1800 r.p.m. The speed of the rotor when plowing is from 120 to 180 r.p.m.

WORKS BACKWARD

The plow assembly is built on a 5-ton truck chassis, and is driven in reverse when plowing. The plowing speed is up to 3 miles per hour and the truck is steered from both ends.

The horsepower of the engine which drives the truck is 114 at peak speed. This gives a total horsepower of approximately 534 for this piece of equipment.

The second machine is an auger blower type plow having a single engine to drive the plow and truck. This engine develops approximately 175 horsepower. This type of plow has been used very successfully by the Division of Highways for the past two seasons.

CLAWS DOWN DRIFTS

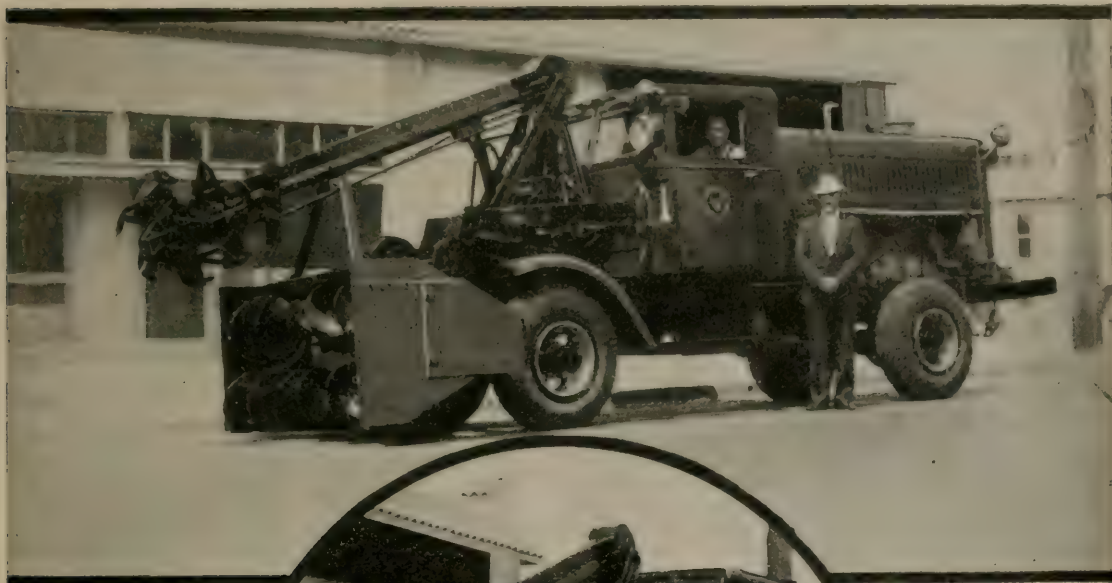
It has a long upper arm equipped with strong steel claws which tears down the drifts moving back and forth across the face of them while the swiftly revolving auger blades below cut their way through.

Both of the big machines, newly painted in the bright orange color adopted by the Department as a safety measure for all road equipment, were exhibited at the State Fair where they excited much interest and attention.

Bobby (short of money): "I say, dad, have you any work you'd like me to do?"

Father (taken by surprise): "Why—no—but—er——"

Bobby: "Then would you like to put me on the dole?"



SWIFT DESTRUCTION awaits snow drifts on California highways when this new auger-type plow goes into action this winter. The long upper arm moves back and forth across the tops of the drifts, tearing them down with its powerful steel claws while the whirling auger blades below macerate and bore through the snow bank.

READY FOR battle with the biggest snow-drifts the combined efforts of Jack Frost and old Boreas can pile up in the Sierra Passes this huge plow is the most powerful of its type yet designed. The rotary blades are driven by a 420 horsepower Liberty aviation motor while the engine of the truck delivers 114 horsepower. Both this plow and the one shown above were built at the Headquarters Shop of the Division of Highways.



Creation Of New Highway District Compels Transfers And Promotions

BY chapter 767 of the Statutes of 1933, the last Legislature added to the State Highway System approximately 6800 miles of county roads and city streets. This increase is an addition of more than 92 per cent of the State highway mileage as of January first of the current year.

On August 21st, the date on which the law became effective, the mileage on the State system jumped from 7350 miles to 14,150 miles.

This sudden doubling of State road mileage has required a readjustment of district boundaries and some shifting of personnel.

NEW DISTRICT FORMED

The most drastic change has been in southern California where it was found necessary to establish an additional district, bringing the total of State highway districts to eleven. The new district, with headquarters in San Diego, has been formed from portions of Districts VII and VIII. Ventura, Los Angeles, Orange and San Diego counties formerly composed District VII and District VIII comprised San Bernardino, Riverside and Imperial counties.

The territory south of the Tehachapi is now distributed between the three districts as follows:

District VII: Ventura, Los Angeles and Orange counties.

District VIII: San Bernardino County and the westerly half of Riverside County.

District XI: San Diego and Imperial counties and the easterly half of Riverside County.

The greatest change made in the north involves the moving of the district offices of Districts III and X from Sacramento to more central locations within their respective districts.

District III comprises Glenn, Butte, Colusa, Sutter, Yolo, Yuba, Sierra, Nevada, Placer, El Dorado counties and a portion of Sacramento County and the district office is now located at Marysville.

Amador, Alpine, Calaveras, Tuolumne, Mariposa, Merced, Stanislaus, San Joaquin

and Solano counties and a portion of Sacramento County compose District X, which office has been moved to Stockton.

The subdivision of the State into the eleven highway districts with their respective boundaries is shown on the map on the adjoining page.

PERSONNEL CHANGES ANNOUNCED

To accommodate the new district and to provide the adequate engineering supervision required by the expansion of the State Highway System many changes within the personnel of the highway organization have been required. These changes as announced by the State Highway Engineer, C. H. Purcell, include the following promotions and transfers among the engineering executives on the staff of the Division of Highways.

G. T. McCoy who for the past two and one-half years has been Principal Assistant Engineer has been promoted to the position of Assistant State Highway Engineer. Mr. McCoy came to the Division of Highways in July, 1927, as Assistant Office Engineer in the Central Office. In 1928 he was made Administrative Assistant to Mr. Purcell and in 1931 he was promoted to Principal Assistant Engineer. Mr. McCoy has had twenty-three years' experience both in the field and in high executive capacities.

J. G. Standley, for the past two and one-half years a Staff Engineer on the Central Office staff, is promoted to Administrative Assistant. Mr. Standley has served the Division of Highways continuously since August, 1914, and his continuous rise through the organization has given him an unquestionable foundation for the position of high responsibility which he now assumes.

NEW DISTRICT CHIEF

E. E. Wallace who has been District Engineer of District VI, with headquarters at Fresno since 1926 has been made District Engineer of the new District XI at San Diego. Mr. Wallace joined the State highway organization in California in 1913 and the work of organizing the new district is in capable and experienced hands as he takes over his new responsibilities.

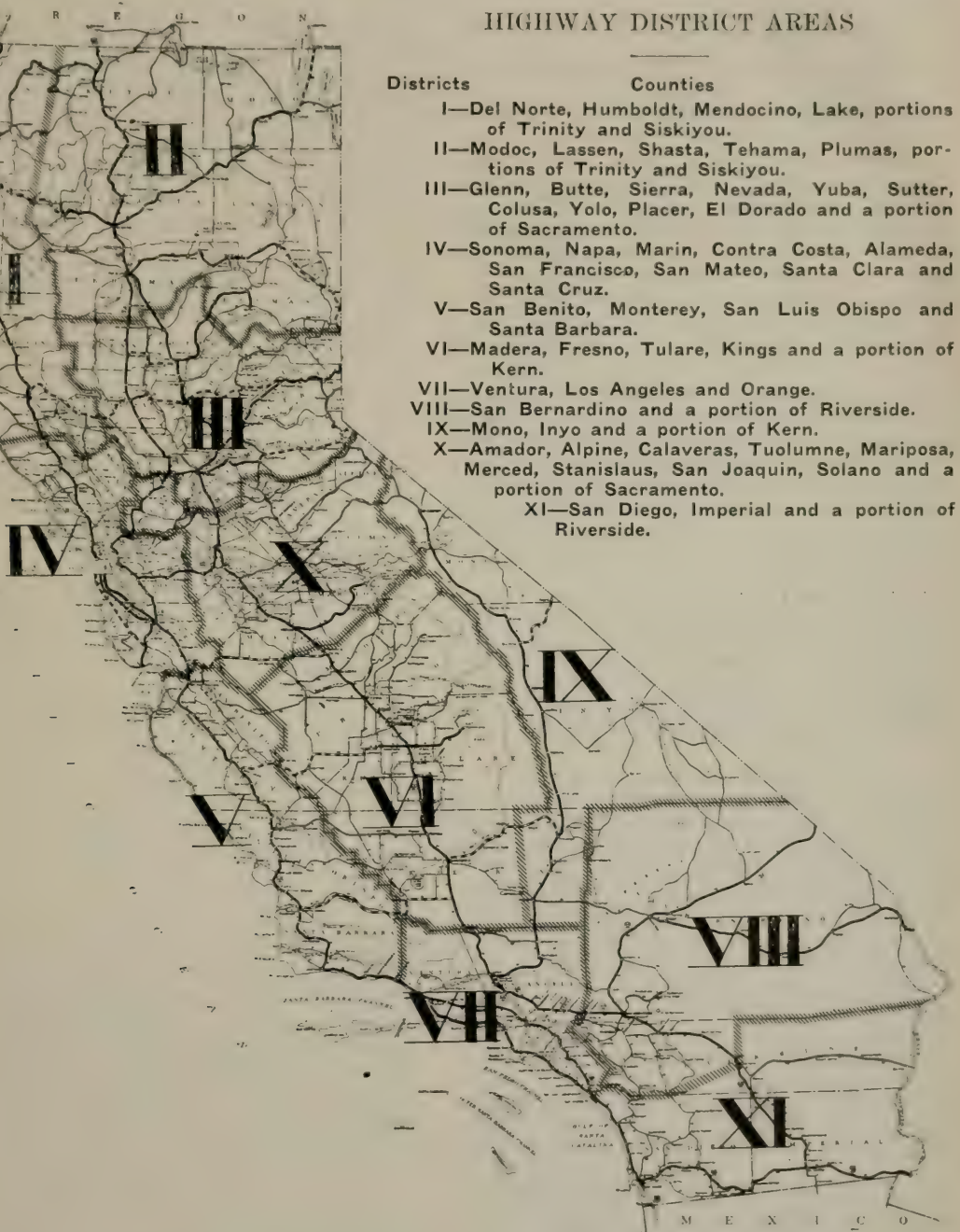
1933 Map Shows Additional District

HIGHWAY DISTRICT AREAS

Districts

Counties

- I—Del Norte, Humboldt, Mendocino, Lake, portions of Trinity and Siskiyou.
- II—Modoc, Lassen, Shasta, Tehama, Plumas, portions of Trinity and Siskiyou.
- III—Glenn, Butte, Sierra, Nevada, Yuba, Sutter, Colusa, Yolo, Placer, El Dorado and a portion of Sacramento.
- IV—Sonoma, Napa, Marin, Contra Costa, Alameda, San Francisco, San Mateo, Santa Clara and Santa Cruz.
- V—San Benito, Monterey, San Luis Obispo and Santa Barbara.
- VI—Madera, Fresno, Tulare, Kings and a portion of Kern.
- VII—Ventura, Los Angeles and Orange.
- VIII—San Bernardino and a portion of Riverside.
- IX—Mono, Inyo and a portion of Kern.
- X—Amador, Alpine, Calaveras, Tuolumne, Mariposa, Merced, Stanislaus, San Joaquin, Solano and a portion of Sacramento.
- XI—San Diego, Imperial and a portion of Riverside.



The vacancy in District VI caused by the transfer of Mr. Wallace is to be filled by R. M. Gillis who has been promoted from Assistant Construction Engineer of the Divi-

sion of Highways to Acting District Engineer at Fresno. Mr. Gillis is an engineer of wide experience both in highway and bridge construction and as an executive. He has had

(Continued on page 19)

Association Will Oppose Referendum

(Continued from page 3)

- (d) Friant Dam, reservoir and power plant on the San Joaquin River.
- (e) Madera Canal extending from Friant Dam to the Chowchilla River.
- (f) Friant-Kern County Canal extending from Friant Dam to Kern River.

REVENUES MUST PAY COSTS

Duty of Authority. The Authority is charged with the responsibility of the operation and maintenance of the project and it is made the duty of that body to fix and establish rates and charges for water and power, and to enter into the necessary contracts for the sale of water and power, so as to provide revenues sufficient to pay all costs and expenses of construction, operation and maintenance of the project, including bond charges, as and when the same become payable.

Bond Issue Authorized. In order to raise the necessary funds for the construction of the project, the Authority is authorized to issue revenue bonds in the aggregate amount of \$170,000,000, such amount, however, to be reduced by the amount of any direct contributions which may be made for the purpose of construction of the project. These revenue bonds will be a direct charge upon, and will be secured *only* by the income and revenue derived from the project, and will not constitute a debt, liability or obligation of the State of California.

Authorized to Condemn Property. Under certain restrictions the Authority is authorized, when property necessary for the construction, operation or maintenance of the project can not otherwise be acquired, to acquire the same by eminent domain proceedings and may, upon commencing such proceedings and depositing appropriate security with the court, take immediate possession of such property.

REASONABLE NEEDS ASSURED

Prior Right of Watershed. The act provides that "In the construction and operation by the Authority of any project under the provisions of this act, no watershed or area wherein water originates, or any area immediately adjacent thereto which can be conveniently supplied with water therefrom, shall be deprived by the Authority directly or indirectly of the prior right to all of said water reasonably required to adequately supply the beneficial needs of said watershed area or any of the inhabitants or property owners therein."

Preference to State Agencies. In awarding contracts for the sale of water and power, in case of equal or equivalent offers, preference is to be given municipalities, political subdivisions and districts. Any such contract with any person, firm or corporation, other than such State agency, shall be subject to cancellation upon five years notice.

Mandamus to Compel Duties. Provision is made for the enforcement by the Authority of any contract obligation undertaken by a municipality, political subdivision or district. Mandamus or other appropriate remedy also is made available to a bond holder to compel the Authority, or any official having duties relating to the act, to perform such duties.

The Central Valley Project if consummated and placed in operation in accord with the provisions of

the bill, would solve the major water problems now existing in the Sacramento and San Joaquin valleys. The Kennett reservoir on the Sacramento River, with a capacity of 2,940,000 acre-feet, the key unit of the project, would materially reduce flood flows on the Sacramento River, restore and improve navigation on Sacramento River to Red Bluff, remove the ever threatened extended litigation between the upper and lower water users on the Sacramento River and repel the invasion of salt water into the rich delta region of the Sacramento and San Joaquin rivers.

The Sacramento-San Joaquin Delta Cross Channel would deliver additional water into the San Joaquin Delta required for salinity control and for industrial and irrigational uses.

The Contra Costa Conduit would furnish fresh water from the delta to the industries and agricultural areas in Contra Costa County, now suffering from lack of water.

By means of the Friant reservoir on the San Joaquin River and the Friant-Kern and Madera canals, irrigation water would be made available to 400,000 acres of highly productive and developed lands in the upper San Joaquin Valley, which now have only half the necessary water supply.

FEDERAL AGENCIES APPROVE

The San Joaquin River Pumping System would, when constructed and put into operation, make available additional water supplies to the upper San Joaquin Valley, but this procedure is not proposed as an immediate step.

Hydroelectric power generated at Kennett would be transmitted over a main transmission line to a substation located near Antioch, Contra Costa County, where it would be distributed.

Federal agencies which have been studying the Central Valley Project with the primary purpose of determining the Federal interest and responsibility therein have recently rendered favorable reports in regard to the project. The Chief of Engineers of the U. S. War Department, Major General Lytle Brown, in his report of June 27, 1933, stated:

"Plans for the Kennett and Keswick dams, Friant Reservoir and irrigation canals in connection with the latter, are well developed from an engineering standpoint and may be promptly undertaken when funds for the purpose are made available. Should they be incorporated in a public works program provided in the National Industrial Recovery Act, the Federal contribution of 30 per cent of the cost of labor and material employed on the project, as provided for in that act, would, from the figures presented by the Division Engineer, place these projects on a self-supporting basis."

"FINANCIALLY FEASIBLE"

The Bureau of Reclamation, U. S. Department of Interior, also reported favorably on the project, as follows: "The Great Central Valley Project designed primarily for the relief of highly developed, settled and producing lands suffering from shortage of water supplies, is meritorious and worthy of financial assistance from the Federal Government through the loaning of noninterest bearing reimbursable funds in

(Continued on next page)

Seeking 30 Per Cent Federal Grant

(Continued from preceding page)

accord with the Federal reclamation policies and precedents. With Federal financing of the project through the employment of noninterest bearing funds for irrigation features, interest bearing funds for the power features and justified direct contributions from the State and Federal governments in the interest of flood control, navigation and other purposes and with fair and reasonable revenues from the sale of electric energy and water, the project for complete initial development is economically and financially feasible." The Bureau of Reclamation report was prepared under the direction of Dr. Elwood Mead, Commissioner, and R. F. Walter, Chief Engineer, by H. W. Bashore, Senior Engineer.

Another Federal body, the U. S. Senate Committee on Irrigation and Reclamation, filed a printed report on its study and investigation of the project. The committee found that there was a large Federal interest and responsibility in the project which should be recognized and provided for by Congress.

AUTHORITY MEMBERS MEET

The members of the Water Project Authority provided for in Assembly Bill No. 259 held a preliminary and unofficial meeting on August 10. At this meeting, the State Engineer was authorized to prepare a preliminary application to the Federal Public Works Administrator for approval of the Central Valley Project, for a 30 per cent grant of the cost of the labor and materials employed in the construction of the project, and for a loan of funds of the remaining cost under the provisions of the National Industrial Recovery Act. A. D. Edmonston, Deputy State Engineer, was named acting secretary. The application is now under preparation. It will be presented to the Public Administrator, Harold L. Ickes, through the State Advisory Board and the Regional Administrator, Justus S. Wardell. The State Advisory Board is composed of three members, Hamilton H. Cotton, Chairman, E. F. Scattergood and Frank R. Havenner. Frank E. Trask is executive officer of the board.

Assembly Bill No. 259, which was passed by a substantial majority vote in the Senate and by a vote of 58 to 11 in the Assembly, may be referred to a vote of the people in accord with law. The Attorney General was requested by F. G. Athearn, attorney of San Francisco and landowner in Sacramento Valley, to prepare a summary and title for a referendum petition on the bill. Such title was prepared by the Attorney General and the petition is being circulated in several parts of the State. In event the necessary number of qualified signatures, approximately 70,000, are obtained, these names must be filed with the county clerks in the respective counties for verification and then filed with the Secretary of State on or before October 24, 1933.

If the petition is prepared and filed in compliance with the law it will not be voted upon until the next general election in November, 1934, unless the Governor calls a special election before that date. The calling of such a special election is discretionary with the Governor. Referring the bill to the vote of the people means delay and possible elimination of the opportunity of obtaining Federal financial aid.

COVER PAGE ILLUSTRATION VISUALIZES GREAT RESERVOIR

The illustration on the front cover page of this magazine is a very carefully drawn picture presenting an aerial view of the Kennett Reservoir as it will appear after the Kennett Dam is built and the waters of the Sacramento, McCloud and Pit rivers back up behind the dam into adjoining canyons to form a great reservoir lake.

The estimated flooded area of the reservoir is 23,000 acres, providing 2,940,000 acre-feet of water storage.

An idea of the great area that will be covered by this body of impounded water can be had by a comparison with the dam shown in the central foreground. This structure will be 420 feet high with a crest length of 2430 feet, and just below it is shown a power house that will be built for an estimated installed capacity of 325,000 K. V. A.

DEFENSE ASSOCIATION ORGANIZED

For the purpose of furthering the Central Valley Project before the Federal Government and of resisting and defeating any referendum on Assembly Bill No. 259, the State Water Plan Association was organized in Sacramento, California, on August 26, 1933. A constitution was adopted and officers, an executive committee and members of the Association were elected.

A large majority of the counties and practically all interests of the State are represented in the Association. The purposes of the Association are clearly stated in the constitution as follows:

(a) To cooperate with and assist the Water Project Authority created by the Central Valley Project Act of 1933 (Chapter 1042, Stats. 1933) in carrying out the purposes, objects and provisions of said act.

(b) To resist and defeat any and all attempts to delay the operation and effect of said act and to resist and defeat any referendum thereof, and also to resist any and all amendments to said act which would tend to defeat or delay the effectuating of its purposes and objects as now exemplified therein.

(c) To aid and assist in securing grants, loans and contributions of funds from the United States or any of its agencies for the purpose of the construction, maintenance and operation of the Central Valley Project, or any part thereof.

(d) To raise funds as herein provided to carry out the foregoing purposes or any thereof.

(e) To furnish to members of this Association such information as may relate to their interests, or the interests which they represent, or as may pertain to the purposes of this Association.

OFFICERS ELECTED

The following executive committee and officers of the Association have been elected:

(Continued on page 20)

Increases Shown in Summer Traffic Count and Gasoline Tax Revenues

A COMPARISON of this and last year's annual July traffic count indicates that the decline in traffic which commenced in 1931 has been checked. Sunday traffic showed an increase of 1.0 per cent over 1932. Monday traffic, however, still shows a slight decline of 1.9 per cent.

For 1933 a small increase was evident in the Sunday traffic on all classes of routes. On the other hand, with the exception of the recreational routes, slight losses were recorded on Monday. The percentages of these differences for the various route classifications are shown in the following tables:

Per Cent Gain or Loss Over Preceding Year

ALL ROUTES

	Sunday	Monday
1930 -----	+7.3	+11.6
1931 -----	-5.6	-0.6
1932 -----	-9.4	-8.3
1933 -----	+1.0	+1.9

MAIN NORTH AND SOUTH ROUTES

1930 -----	+ 7.3	+12.6
1931 -----	- 6.1	+ 0.4
1932 -----	-12.3	-11.0
1933 -----	+ 1.5	- 2.2

LATERALS BETWEEN INLAND AND COAST

1930 -----	+ 6.4	+8.1
1931 -----	- 5.5	-2.5
1932 -----	-10.1	-8.7
1933 -----	+ 0.1	-2.6

INTERSTATE CONNECTIONS

1930 -----	+13.8	+17.0
1931 -----	+ 9.1	+10.6
1932 -----	- 4.5	- 0.5
1933 -----	+ 1.9	- 1.4

RECREATIONAL ROUTES

1930 -----	+ 5.0	+ 8.5
1931 -----	-11.7	-19.2
1932 -----	- 0.5	- 0.4
1933 -----	+ 0.2	+ 0.3

UPWARD TREND SHOWN

The change in the rate of decline in traffic is not remarkable, but it is worth considering in conjunction with gasoline consumption. With the exception of June, 1932, when the Federal tax of one cent per gallon was imposed, each month in 1932 showed a decrease in gas consumption when compared

with the corresponding month in 1931. Like comparisons for the first six months in 1932 and 1933 show similar results.

However, it is notable that an increase in gas consumption was recorded for July, 1933, when the total tax assessed exceeded the 1932 figure by \$226,275.66, and the 1931 figure by \$32,667.75. Thus the smallest rate of change in the traffic census since 1931 corresponds with the first upward trend in gas consumption since 1931.

The addition of 6800 miles of road to the State highway system presents several difficulties in administration, not the least of which is the allocation of funds. By and large the volume of traffic, actual and potential, determines the standards of construction and maintenance, and hence controls the expenditure of funds. In view, then, of the importance of adequate traffic counts, steps have already been taken to obtain traffic data on the new secondary roads.

COUNTIES HAVE DATA

In some cases counties have obtained data which are directly comparable to those on the State highway system. Orange County forces, under the direction of Nat H. Neff, county engineer, have for some years coordinated a summer traffic census at twelve stations on county roads with the census on State roads. Similarly, C. A. James has directed counts at 68 stations for the Kern County Planning Commission.

Approximately 45 per cent of the total traffic is carried on the main north and south routes, 26 per cent on the laterals, 17 per cent on the recreational routes, and 12 per cent on the interstate routes.

ALL ROUTES COVERED

The count taken on July 16 and 17 between the hours of 6 a.m. and 10 p.m. covered the traffic on all State highway routes, the vehicles being segregated by hourly periods under the following classifications: California automobiles, foreign vehicles, light trucks under two tons, heavy trucks, trailers, busses and horse-drawn vehicles.

(Continued on page 22)



CARRYING out Governor Rolph's urgent instructions that jobs be provided as quickly as possible with road funds the Division of Highways has launched a construction program of unprecedented magnitude. Working night and day after August 21st when the bill adding 6800 miles of secondary roads became a law the engineering staff of the Division of Highways, under State Engineer C. H. Purcell, prepared plans, estimates and specifications for road and bridge construction projects enabling Director of Public Works Earl Lee Kelly to announce on August 25th publication of a call for bids on fifty contracts estimated to cost approximately \$4,018,100, covering work on 470 miles of road and eight bridges.

This broadside of public works for the double benefit of California's citizens was made possible by the allocation to California of \$16,000,000 by the Federal Government under the authority of the National Industrial Recovery Act, and \$35,690,000 from gasoline tax revenues budgeted by the California Highway Commission.

Hearty Cooperation by Federal Bureaus

That this enormous program has been so successfully begun is a monument to the whole-hearted cooperation which has obtained during this emergency between the engineering staff and officials of the Division of Highways and the officials of the National Recovery Administration and engineering staff of the United States Bureau of Public Roads.

Bids were opened on the projects advertised August 25th on September 13th, 14th and 15th, and it is planned that the work will begin on the contracts about October 15th.

Work under these contracts will be governed by the requirements of the California Recovery Act and the National Industrial Recovery Act. Wages, hours and conditions of employment, the use of a maximum of hand labor methods, construction methods designed to provide a maximum of employment, and compliance with codes of fair competition are all stipulated in the specifications and made a part of the contracts thus insuring to the citizenry of California that the spirit of National recovery will obtain on all State highway work.

It is estimated that on this first lot of contracts in highway construction program, between 3500 and 4000 jobs will be created during the coming months. As the work involved in these 50 contracts will be spread throughout 32 counties, the jobs provided will be similarly spread and the employment so provided will furnish relief to ten or twelve thousand Californians in these areas.

Million-dollar-a-week Advertising Program Planned

While the large volume of contracts started by the advertising of August 25th is of record-breaking proportions, it must be remembered that this is just the beginning of a highway construction program that will proceed at a steady pace throughout the coming months. It is planned that the advertising of projects will continue at a rate of from one to two million dollars a week throughout the fall and early winter months with the object of providing "JOBS AND MORE JOBS!"

The tabulation and summary of August advertising to be found on the next two pages presents a vivid picture of the magnitude of work advanced to bids in the efforts of the California Highway Commission, the Department of Public Works and the Division of Highways to speed recovery under the leadership of Governor Rolph:

Record-Breaking Highway Program

County	Location	Miles	Type
Butte	Across West Branch of Feather River 14 miles north of Oroville	---	Reinforced concrete arch bridge
Shasta	Boulder Creek to 1.5 miles north of Bella Vista	9.1	Grade and bit. treated surface
*Mendocino	Across Feliz Cr. at Hopland	---	Steel stringer bridge
*Santa Cruz	1 mile north to Inspiration Point	0.8	Graded roadbed
*Sonoma-			
Mendocino	Cloverdale to Hopland	13.9	Gravel surface
Monterey	San Ardo to King City	74.0	Bituminous treated surf. (portions)
*Santa Barbara	At Elwood	0.8	Pavement on approaches to overhead crossing
*Kern	Pierce Road to Tank Farm	2.1	Grade and pavement
*Mariposa	Orange Hill School to Mariposa	15.1	Bituminous treated surface
*Los Angeles	Orange Ave. to Barranca St.	3.8	Grade and pavement
*Imperial	East Highline Canal to Sand Hills	23.7	Pavement
Imperial	Holtville to East Highline Canal	6.9	Oil treated borders
Mono	Sherwin Hill Summit to Whiskey Canyon	3.7	Grade and bituminous treated surf.
Plumas	Across North Fork of Feather River at Howells	---	Steel arch bridge
*Placer	Loomis to Newcastle	5.2	Grade and pavement
Napa	Easterly Boundary to Napa Wye and Napa Wye to Southerly Boundary	8.2	Bituminous surface treatment
Marin-Sonoma	Across Petaluma Creek at Green Point	---	Repairing timber bridge
San Luis Obispo-			
Monterey	Various Locations	17.2	Oiling shoulders
*Madera	Across Ash Slough 1/2 mile north Chowchilla	---	Timber bridge
*Los Angeles	Foothill Boulevard to Alost Avenue	0.6	Grade and pavement
*Los Angeles	Santa Clara School to Castaic School	5.1	Grade and pavement
Los Angeles-			
Orange	Various Locations	31.0	Oiling shoulders
Imperial	Northerly Boundary to Tri-folium Canal	25.6	Oil treated borders
Imperial	El Centro to Calexico	10.1	Bituminous surface treatment
Riverside	Black Butte to Blythe	9.2	Grade and oil treated surface
*Solano-Napa	Carquinez Bridge to Cordelia	10.3	Graded roadbed
*Colusa-Glenn	Maxwell to Norman	7.1	Grade and surface
*Placer-Nevada	Drum Canal to Yuba Pass	4.2	Grade and bituminous treated surf.

Advanced to Bids August 25, 1933

County	Location	Miles	Type
Mendocino	Ukiah to Hopland	9.5	Bituminous surface treatment
*Mendocino	Across Russian River 2 miles south Hopland	---	Steel truss bridge
Merced	Northerly Boundary to Livingston	6.2	Bituminous surface treatment
*Tulare	Westerly Boundary to 2 Mi. south of Plaza Garage	5.0	Grade and pavement
Ventura-Los Angeles	Ventura to Castaic Junction	40.3	Seal coat on shoulders
San Bernardino	At Mt. Vernon Ave. Viaduct	0.2	Grade and pavement
Riverside-Imperial	Avenue 62 to 10 miles south of Riverside-Imperial County line	21.7	Oiling shoulders
Riverside	Riverside to Elsinore	25.1	Oiling shoulders
Riverside	Corona to Southerly Bndy.	41.6	Oiling shoulders
Inyo	Bishop to Owens River Canal	3.5	Grade and bituminous treated surf.
*Sacramento	Between Sacramento and McConnell	---	Widen bridges and culverts
*Contra Costa	In Valona	0.2	Grade and pavement
Los Angeles	Colby Canyon to Mount Wilson Road	4.0	Graded roadbed
El Dorado	Across Greenwood Creek 12 miles north of Placerville	---	Timber bridge
Imperial	Araz to Colorado River	6.0	Oiling shoulders
San Bernardino	Needles to Topock	14.3	Bituminous surface treatment
Kern	Between 6 and 10 miles east of Bakersfield	2.0	Bituminous surface treatment
Kings	West of Lemoore	2.7	Bituminous surface treatment
Tulare	South Bndy. to Kingsburg	46.0	Seal coat on shoulders
Glenn, Placer-Colusa	Various Locations	14.2	Bituminous surface treatment
Los Angeles	Vasquez Rock Road to 2 miles east	2.0	Bituminous surface treatment
Sonoma	Willow Brook to Haystack	4.2	Bituminous surface treatment

* Financed with the aid of National Recovery Highway Funds.

SUMMARY OF AUGUST ADVERTISING

Type	Miles	Amount
Pavement.....	46.7	\$1,205,100
Bituminous treated surfacing.....	64.9	791,400
Bituminous treatment, borders, shoulders oiling.....	334.0	506,100
Graded roadbed.....	24.2	1,174,100
Bridges.....	(8)	341,400
Totals.....	469.8	\$4,018,100

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY.....Director
JOHN W. HOWE.....Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 11

SEPTEMBER, 1933

No. 9

LONG NEEDED LAW

California at last has a roadside advertising law, designed to protect the scenic beauty of the State's motor routes and prevent accidents by the elimination of dangerous advertising signs. This measure has been signed by Governor Rolph and became effective August 21.

Billboards are perfectly legitimate if kept in their place and roadside services of all kinds have a right to use advertising signs, but they should not be of an unsightly nature, nor should they be placed where they obstruct the motorist's view of the highway.

The new law requires that all firms engaged in the outdoor advertising business must pay a license fee of fifty dollars a year to the State, and that permits must be obtained for the erection of each advertising sign. Permit fees of twenty-five cents a sign and one dollar for each billboard or other advertising structure will be required by the State.

The law prohibits signs within the right-of-way of any highway, and provides limitations on placing structures within three hundred feet of a highway intersection or grade crossing. It prohibits placing of advertising signs where they might prevent a clear view of approaching traffic along a highway for a distance of five hundred feet. It also prohibits any sign visible from highways which imitate any direction or warning sign permitted by State law, such as the words "Stop" or "Slow Down."

California has long needed such regulation of roadside advertising. Those who use such signs will gain favor in the eyes of the traveling public by observing the regulations and thus demonstrating their spirit of cooperation.—*Santa Rosa Press-Democrat.*

Bay Bridge Officials Talk With All Jobs By Radio Telephone

ULTRA high frequency radio telephones are making conversation possible from isolated bridge piling driven into the bay, from launches, and the offices of the San Francisco-Oakland Bay Bridge in Oakland and San Francisco.

The radio telephone that will connect boats and piers and central construction offices is the invention of and is being installed by D. Reginald Tibbetts, who has entered into contracts with the San Francisco-Oakland Bay Bridge Division, Bridge Builders, Inc., and the Transbay Construction Company, to install 22 radio telephones between construction points and headquarters.

CONNECTS OFFICES AND WORK

This is the first time the ultra high frequency telephone, regarded by the Federal Radio Commission as an experiment, has been used on any construction job. By its use Bay Bridge officials and contractors can speak from their offices to their men at work on the bay from either shore, or can intercept men in boats on their way to the job.

Tibbetts, the inventor, is a University of California senior and was runner-up in the Edison National Intelligence Contest for young men six years ago.

He installed the first police radio equipment on the coast in 1927 when he made an installation for Chief of Police August Vollmer in Berkeley when he was 16 years old.

He is an electrical engineering student and vice chairman of the University of California branch of the American Institute of Electrical Engineering.

SIMPLE EQUIPMENT

The radio telephone operates on a 4- to 6-meter wave length compared to 500- to 1500-meter wave lengths used for broadcasting.

The telephones are simple in appearance and use standard telephone receivers and transmitters attached to a box resembling a small radio receiving set.

Chief Engineer C. H. Purcell, in awarding the contract for the San Francisco-Oakland Bay Bridge, declared that communication to the inaccessible points on the bay would prevent expensive trips of messengers and would effect tremendous savings during the years of bridge construction.

Many Changes in District Personnel

(Continued from page 11)

twenty-five years' experience in highway engineering work.

There is one change that is noted with regret on the part of many of the State highway organization and that is the departure of District Engineer H. S. Comly on a year's leave of absence. Mr. Comly has been in charge of District I with headquarters at Eureka for the past year and a half. One of the oldest engineers, in length of service, Mr. Comly joined the Division of Highways in February, 1912, and has given continuous service for nearly 22 years. In 1924 he was made District Engineer of District II, which position he held until he was transferred to District I in 1932.

Mr. Comly's position will be filled by J. W. Vickrey who has been Acting District Engineer of District IX at Bishop. Mr. Vickrey now becomes Acting District Engineer of District I. He came to the Division of Highways in August, 1917, and was chosen as the engineering executive for District IX upon the retirement of F. G. Somner in 1932.

District Maintenance Engineer S. W. Lowden of District II at Redding has been promoted to Acting District Engineer and will assume charge of District IX at Bishop. Mr. Lowden has been with the Division of Highways since 1912.

IMPORTANT ASSIGNMENT

With highway construction as one of the main factors in the National Recovery Program the construction program of the California Division of Highways has been geared to high speed. That this construction program be advanced to actual work and jobs for thousands of Californians, necessitates a maximum coordination of all departments. To this end L. V. Campbell, Office Engineer at the Central Office of the Division has been temporarily assigned to the field to contact the eleven district offices and thereby coordinate the work of getting construction projects under way as rapidly as possible for the unusual program just begun. Mr. Campbell has been with the Central Office since 1922.

R. H. Wilson, Office Engineer of District III has been transferred to the Central Office as Acting Office Engineer to take over the duties of Mr. Campbell. Mr. Wilson joined the California Division of Highways in 1912 and served until 1915. With

the exception of two years during the war, he was actively engaged in highway construction in the employ of other States for the next twelve years. In 1927 Mr. Wilson returned to the California Division of Highways and has served in both Districts I and III.

The formation of the new District XI and the consequent changes in executives has caused many changes among the engineering assistants in the various districts. The most notable of these changes are as follows:

ADDITIONAL TRANSFERS

I. A. THOMAS, District Office Engineer, District I at Eureka transferred to District Office Engineer, District XI at San Diego.

C. P. SWEET, Resident Engineer in District I at Eureka is promoted to District Office Engineer, District I.

G. E. HELLASOE, District Maintenance, District I transferred to Central Office as Assistant Maintenance Engineer of the Division of Highways.

R. L. THOMAS, Locating Engineer in District VII at Los Angeles is promoted to District Maintenance Engineer, District I, at Eureka.

R. L. BEUTHAL, District Office Engineer, District VI, at Fresno transferred to District Construction Engineer District XI at San Diego.

C. F. WAITE, Resident Engineer in District II at Redding promoted to District Office Engineer, District VI at Fresno.

J. M. SORENSON, Resident Engineer in District VI, at Fresno promoted to District Maintenance Engineer, District XI at San Diego.

M. E. CESSNA, Locating Engineer in District V at San Luis Obispo transferred to Chief Draftsman, District XI at San Diego.

G. F. PINGRY, Assistant Right of Way Agent, District VI at Fresno promoted to Right of Way Agent, District XI at San Diego.

A. E. ANDERSON, Chief Clerk, District VI at Fresno transferred to Chief Clerk, District XI at San Diego.

A. H. HENDERSON, Assistant Disbursing Office, Department of Public Works at Sacramento transferred to Chief Clerk, District VI at Fresno.

Ground Broken in Ventura County for Greatest State Hospital in West

THE ceremony of turning the first shovelful of earth in connection with the beginning of building construction for the Camarillo State Hospital in Ventura County held at 2 o'clock p.m. on August 15th was a very notable occasion in several important respects.

Governor Rolph made the principal address of the day and performed the ceremony itself.

Dr. J. M. Toner, Director of the State Department of Institutions, presided.

Mrs. Joseph Lewis, wife of one of the former owners of the property, presented the Governor with the official shovel.

GREATEST IN WEST

The ceremony marked the beginning of building construction work which ultimately will house the greatest State hospital in the west if not in the entire country. The ultimate cost of the buildings required for the institution will be in the neighborhood of \$8,000,000 and the ultimate patient capacity will be 6000 with additional provision for 1000 employees.

The new institution will be the seventh California State Hospital for the Insane and this Ventura County site is conceded to be altogether the best site of the seven available for such an institution.

Mr. Adolpho Camarillo was present with Mrs. Camarillo and in a very effective address accepted the honor of having this great institution named the Camarillo State Hospital.

A stirring address was made by Judge Robert M. Clarke, prominent attorney of Los Angeles, formerly of Ventura County. Mayor Frank Shaw, of Los Angeles, represented that city in a speech of felicitation and Earl Lee Kelly, Director of Public Works, who was unable to be present was represented by State Architect George B. McDougall.

WORK UNDER WAY

There were approximately 2000 persons in attendance and many took advantage of the delightful day to look over the 1700-acre site.

Contracts have already been let and work is under way on two of the dormitory units for patients which will cost about \$100,000 and accommodate 186 patients.

Other units will be put out for bids within the next few weeks.

Out of \$1,695,000 already made available for the institution, about \$400,000 was used to purchase the site and the remaining \$1,295,000 will provide for additional patient accommodations sufficient to bring the total capacity at the opening of the institution up to about 1000 patients. Present funds in addition will provide for various necessary services for water, sewage disposal, electricity, roads, landscaping, etc., also for necessary furnishings for the buildings including laundry, bakery and kitchen equipment.

It is anticipated that the new institution will be ready for receiving the first 1000 patients by January, 1935.

WATER PROJECT MEANS WORK FOR 25,000

(Continued from page 13)

The executive committee named is as follows: District No. 1, Francis Carr, Redding; District No. 2, Jesse Poundstone, Grimes; District No. 3, A. B. Tarpey, Fresno and P. D. Nowell, Tulare; District No. 4, W. B. Hogan, Stockton; District No. 5, George A. Atherton, Stockton; District No. 6, C. W. Schedler, Pittsburg; District No. 7, Vacancy; District No. 8, Matt I. Sullivan, San Francisco; District No. 9, J. M. Inman, Sacramento; at large, B. S. Crittenden, Stockton.

Officers of the Association are: B. S. Crittenden, president and chairman of executive committee; J.

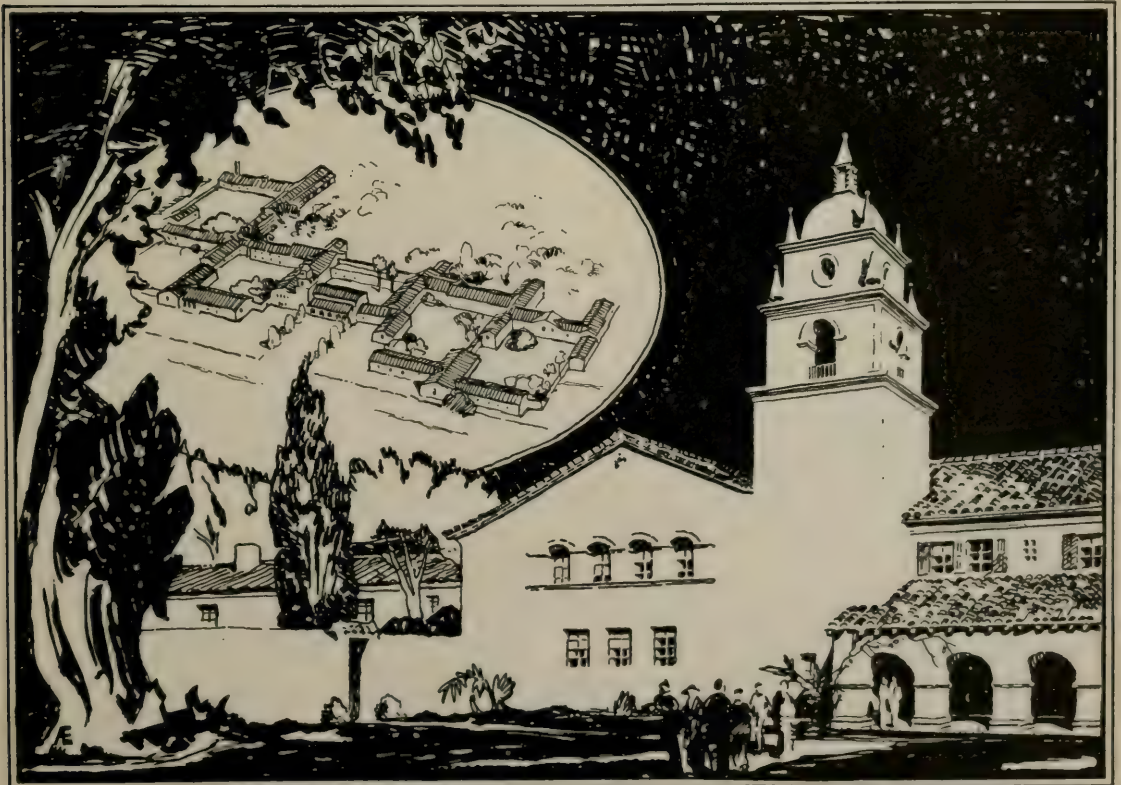
M. Inman, vice president, vice chairman and treasurer; P. D. Nowell, secretary of Association and executive committee.

The executive committee formed itself into an active campaign committee to oppose the referendum on A. B. No. 259, and to place before the public the facts and figures pertaining to the project and the legislative act.

Summarizing the important features of the bill and the project, the success of the plan is vitally important to the present and future welfare and development of California. Its public advantages and benefits are great in magnitude and many in number. The construction of the project would involve the expenditure of \$170,000,000, mostly for labor. More than 25,000 men would be gainfully employed for four years, representing about 200,000,000 man hours of labor.



CEREMONIAL GROUP at the ground-breaking for Camarillo State Hospital. Left to right are: Mrs. Josephine Lewis, Mrs. Adolfo Camarillo, Governor Rolph, Adolfo Camarillo, and Dr. J. W. Toner.



MEDITERRANEAN STYLE architecture characterizes the main entrance to the administration and hospital unit of the custodial male group. Six units under construction are shown in the inset.

Tabulation of Annual July Traffic Count on State Highways

(Continued from page 14)

Gain or loss in traffic volume for all State highway routes, expressed as a percentage of the July, 1932, count, is as follows:

Route	Termini	1933			
		Per cent gain or loss		Sunday	
		Gain	Loss	Gain	Loss
1	Sausalito-Oregon Line	7.0		1.5	
2	San Francisco-Mexico Line	0.1		5.2	
3	Sacramento-Oregon Line		0.2	0.2	
4	Sacramento-Los Angeles	0.2		2.9	
5	Stockton-Santa Cruz	1.4		4.0	
6	Sacramento-Woodland Junction	2.2		3.4	
7	Benicia-Tehama Junction	5.1	2.9		
8	Ignacio-Cordelia	9.6	2.5		
9	San Fernando-San Bernardino	1.8		3.2	
10	San Lucas-Sequoia National Park	2.4	4.5		
11	Sacramento-Nevada Line via Echo Pass		7.2	8.5	
12	San Diego-El Centro		1.7	9.2	
13	Salida-Route 23 via Sonora Pass	14.0		6.3	
14	Albany-Martinez		7.4	1.5	
15	Route 1 near Calpella-Route 37 near Cisco	1.4		2.7	
16	Hopland-Lakeport		8.2	5.4	
17	Roseville-Nevada City	34.7	34.9		
18	Merced-Yosemite National Park		6.7	15.2	
19	Route 9, W. of Claremont-Beaumont via Riverside		10.1	12.2	
20	Redding-Route 1 near Arcata	17.4		14.9	
21	Route 3, Richvale-Route 29 via Quincy		2.7	6.0	
22	San Juan Bautista-Route 32 via Hollister		14.1	0.3	
23	Saugus-Alpine Junction		5.6	5.3	
24	Lodi-Route 23, Ebbetts Pass	2.5			0.1
25	Nevada City-Downieville		15.3	2.2	
26	Los Angeles-Mexico via San Bernardino	2.3		0.9	
27	El Centro-Yuma, Arizona		10.5	8.1	
28	Redding-Nevada Line	21.2	21.1		
29	Red Bluff-Nevada Line	11.1		8.3	
31	San Bernardino-Nevada Line (Jean)		3.0	0.3	
32	Gilroy-Route 4 near Califa		8.0	1.9	
33	Paso Robles-Famosa		8.4	5.9	
34	Twin Cities-Route 23, Carson Pass	12.1		3.2	
35	Peanut-Kuntz		35.0	54.4	
37	Auburn-Truckee via Donner Pass	4.2		3.9	
38	Meyers-Nevada Line via Truckee River	15.9		21.0	
39	Tahoe City-Nevada Line		2.9	20.6	
40	Route 13-Route 23, Tioga Pass		8.6	7.4	
41	General Grant National Park	118.6		177.9	
42	Route 55-California Redwood Park	17.4		1.2	
43	Newport Beach-Big Bear Lake via San Bernardino		5.7	1.6	
44	Boulder Creek-California Redwood Park		9.3	17.9	
45	Willows-Route 3 near Biggs		12.5	3.8	
46	Klamath River Road		6.7	14.8	
47	Orland-Chico		11.1	0.2	
48	McDonalds-Navarro River Road		3.7	7.8	
49	Calistoga-Route 15 near Lower Lake	10.8		5.9	
51	Santa Rosa-Schellville		5.5	2.5	
52	Alto-Tiburon		3.6	9.7	
53	Fairfield-Lodi		3.3	0.3	
54	Michigan Bar-Central House		47.1	29.7	
55	San Francisco-Route 5, Glenwood		16.4	7.1	
56	Carmel-San Luis Obispo		36.6	4.5	
57	Route 2 near Santa Maria-Route 23 near Freeman		3.1	2.3	
58	Bakersfield-Arizona Line (Topock)			3.3	9.7
59	Route 4 near Bailey-Route 31 near Cajon Pass			1.9	39.4
60	Route 2 (El Rio)-Route 2 (Serra)			1.1	1.8
61	La Canada-Route 62, Pine Flats			22.6	6.8
63	Big Pine-Nevada Line		19.3	23.9	
64	Mecca-Arizona Line		37.9	36.6	
65	Auburn-Sonora			0.2	3.4
66	Mossdale-Manteca			2.9	13.1
67	Route 2-Pajaro River			36.7	49.8
68	San Francisco-San Jose via Bayshore		5.3	11.2	
69	San Rafael-San Quentin		52.8	2.1	
70	Ukiah-State Hospital, Talmadge			8.2	23.2
71	Crecent City-Oregon Line		5.6		4.6
72	Weed-Oregon Line		21.9		16.4
73	Alturas-Oregon Line		5.1		41.3
74	Napa Wye-Carquinez Bridge		4.8		5.7
75	Oakland-Walnut Creek			6.2	13.5
76	Bishop-Nevada Line		9.7		6.5
77	Pomona-San Diego		2.6		6.5
78	Riverside-Temecula			6.5	1.9
79	Ventura-Castaia			0.6	9.4
80	Zaca-Santa Barbara			6.1	2.3

Highway Bids and Awards for the Month of August

ALAMEDA COUNTY—Between Mission San Jose and Warm Springs, 1.9 miles of bituminous surface treatment. Dist. VI, Rt. 5, Sec. C. Granite Const. Co., Watsonville, \$17,396; Heafey-Moore Co., Oakland, \$17,795; Pacific Truck Service, \$19,068. Contract awarded to Tiffany Const. Co., San Jose, \$16,839.

FRESNO COUNTY—Between Kingsburg and Selma, 3.7 miles nonskid bituminous surface treatment. Dist. VI, Rt. 4, Sec. A. Granite Const. Co., Watsonville, \$4,443; L. A. Brisco, Arroyo Grande, \$5,292. Contract awarded to Stewart & Nuss, Inc., Fresno, \$4,405.

KERN COUNTY—Between Wasco and Famosa, 8.7 miles bituminous shoulder treatment. Between Bakersfield and Kern Canyon and between Monolith and Cameron, 14.3 miles existing roadbed, bituminous surface treatment. Dist. VI, Rts. 33, 57, 58, Secs. D, E-F, G. Granite Const. Co., Watsonville, \$7,685; F. W. Nighbert, Bakersfield, \$9,125; Gogo & Rados, Los Angeles, \$8,096. Contract awarded to John Jurkovich, Fresno, \$6,723.

LOS ANGELES COUNTY—Between Palamos Cr. and Whitaker Ridge, 6.8 mile slopes excavated. Dist. VII, Rt. 4, Sec. G.H. Lang Transportation Corp., Los Angeles, \$82,745; Ugleias Bros., Inc., San Diego, \$81,239; Weymouth Crowell Co., Los Angeles, \$99,933; T. L. Parker, Los Angeles, \$109,446; Jahn & Bressi Const. Inc., Los Angeles, \$58,339; Hall-Johnson Co., and M. S. Ross, Alhambra, \$89,986. Contract awarded to von der Hellen and Pierson, Berkeley, \$56,717.

LOS ANGELES COUNTY—At San Gabriel Canyon near Azusa about 6 miles treated with heavy fuel oil and 9.3 miles of seal coating. Dist. VII, Rt. 62, Sec. A. Kemper Const. Co. Ltd., Los Angeles, \$15,260; George Gardner & Sons, Redlands, \$11,476; J. E. Haddock, Ltd., Pasadena, \$15,844; P. J. Akmadich, Los Angeles, \$14,914; Gogo & Rados, Los Angeles, \$13,441; Alex D. Chalmers & Max Winter, Jr., Los Angeles, \$12,539; Sander Pearson, Santa Monica, \$13,546; Clyde W. Wood, Stockton, \$15,472. Contract awarded to Matich Bros., Elsinore, \$13,355.

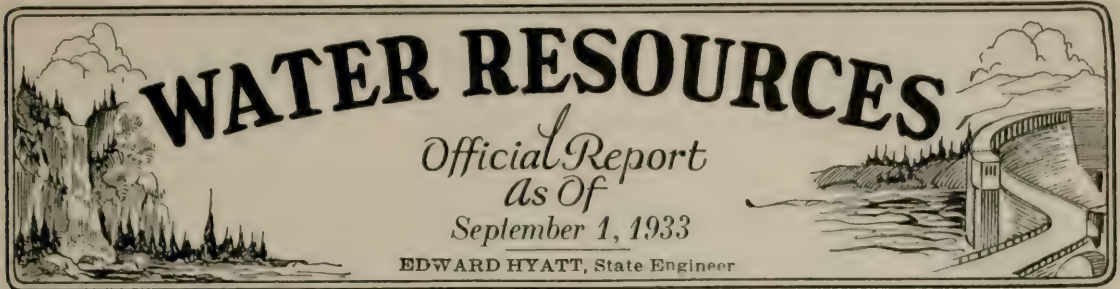
LOS ANGELES COUNTY—Between Neenach School and Del Sur Road, 18.6 miles of roadbed and 2 miles earth shoulders treated with asphaltic road oil and between Wet Canyon and Colby Creek, 5.1 miles roadbed treated with asphalt road oil and bituminous treated seal coat applied. Dist. VII, Rts. 59 and 61, Secs. A.B.C and A. Gibbons & Reed Co., Burbank, \$35,380; George Gardner & Sons, Redlands, \$19,623; Oilfields Trucking Co., Bakersfield, \$23,895; Southwest Paving Co., Los Angeles, \$24,357; Alex D. Chalmers and Max Winter, Jr., Los Angeles, \$25,839; Dimmitt & Taylor, Los Angeles, \$26,587. Contract awarded to Gogo & Rados, Los Angeles, \$15,751.

MADERA COUNTY—Around Madera, 21.1 miles of shoulder bituminous treatment. Dist. VI, Rt. 4, Secs. A, B, C, D. L. A. Brisco, Arroyo Grande, \$14,176; Tiffany Const. Co., San Jose, \$15,480; Granite Const. Co., Watsonville, \$13,477. Contract awarded to Stewart & Nuss, Inc., Fresno, \$12,811.

MARIN AND SONOMA COUNTIES—Between Ignacio and Fairville about 10 miles of bituminous surface treatment. Dist. IV, Rt. 8, Sec. A. Pacific Pavements Co., Ltd., San Francisco, \$22,112; A. J. Ralsch Co., San Francisco, \$20,497; Pacific States Const. Co., San Francisco, \$21,760. Contract awarded to E. A. Forde, San Anselmo, \$20,300.

SAN DIEGO COUNTY—Between Broadway and Harasty Sts., 1.8 miles graded and paved Portland cement concrete. Dist. VII, Rt. 2, Sec. E. Matich Bros., Elsinore, \$88,434; Weymouth Crowell Co., Los Angeles, \$84,287; B. G. Carroll, San Diego, \$72,758; Gogo & Rados, Los Angeles, \$84,309; V. R. Dennis Const. Co., San Diego, \$81,953; Basich Bros., Torrance, \$84,446. Contract awarded to Griffith Company, Los Angeles, \$70,086.

SAN DIEGO COUNTY—Between Barnett Ave. and Balboa Ave., 4.4 miles paved with asphalt concrete. Dist. VII, Rt. 2, Sec. E. Southwest Paving Co., Los Angeles, \$129,923; V. R. Dennis Const. Co., San Diego, \$94,859; Daley Corporation, San Diego, \$97,871; Basich Bros., Torrance, \$116,155; Jahn & Bressi Const., Los Angeles, \$107,769. Contract awarded to Griffith Co., Los Angeles, \$92,782.



By an agreement with Governor Rolph and the Director of Finance it has been arranged to carry on an important part of the work of the Sacramento-San Joaquin Water Supervisor, for which the Legislature provided no funds, by cooperation with the Permanent Committee of the River Problems Conference and water users who will finance the operations for the second half of the biennium.

In signing A. B. 259 on August 5, Governor Rolph made possible a means of obtaining 40 to 50 million dollars for the Central Valley Project of the State Water Plan from N. I. R. A. funds. It is also planned to secure 1000 to 1400 Civilian Conservation Camp men for clearing work on the Sacramento Flood Control work for which no funds are otherwise available.

News of the irrigation districts, details of dam construction, water distribution and other activities of the Water Resources Division are contained in the monthly report of State Engineer Edward Hyatt which follows:

IRRIGATION DISTRICTS

Some thirty amendments or additions to the Irrigation District Act or other acts affecting the operation of irrigation districts, were enacted by the fiftieth session of the Legislature. The most important of these relate to the levying and collection of assessments, penalties on delinquencies, redemptions, disposal of lands deeded to the State for taxes upon which irrigation districts hold assessment claims and providing for an extension of time for the payment of outstanding district warrants and for the allocation of specific funds for such payments; and setting up a court procedure whereby the indebtedness of a defaulted district may be compromised through a plan agreed to by the directors of the district and two-thirds of the holders of such indebtedness, with the consent of the districts securities commission.

Bulletin No. 18-C, a revision of the California Irrigation District Act and related laws, which is being compiled by the Legislative Counsel in cooperation with this office, is well along toward completion.

The East Contra Costa Irrigation District approved a refunding bond issue of \$1,153,000 at a special election held on August 12, 1933.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period only routine maintenance has been performed on the levees, structures, drains and equipment, with a reduced force.

Emergency Flood Protection and Rectification of Rivers.

The camp near Lompoc operated by this Division in cooperation with Santa Barbara County as an unemployment relief project, for clearing the channel of the Santa Ynez River, was dismantled on August 17th, and the equipment returned by freight to Sutter. Supervisor Ronald M. Adam reports that the camp was a real success. A menace was removed by clearing the river and thus preventing any damage during flood season, and helpful employment was given to a group of single men who were a real problem to the county, taking them out of competition with family men for the jobs that were available. The camp was established on February 4th, and continued in operation until August 15, 1933. All clearing work in the river channel was completed.

Two requests have been received to undertake additional cooperative bank protection work on the Mad River, one to cost \$2,500, near the Redwood Highway bridge, and one to cost \$600, on the ranch of James B. Moore.

Sacramento Flood Control Project—Construction.

In connection with the program to continue the work of the Civilian Conservation Corps for an additional six months period, the State Reclamation Board and this office have been active in attempting to secure the establishment of camps for the purpose of performing work on the flood control project, to consist principally of channel clearing. Favorable reports have been forwarded by the officers in charge, in respect to this proposal, covering the establishment of five camps at the following points: Nicolaus, near Knights Landing, Sutter Buttes, District 10, and Gridley bridge. If established, these camps will employ from 1000 to 1400 men for a period of six months.

The employment of the men in the CCC camps, as proposed, will in no way deprive local labor of work, inasmuch as no funds are available for this purpose and the work could not be accomplished except in this manner. Supervision of the work of the camps will require the services of a number of local skilled men.

Russian River Jetty.

Work will be commenced about September 10th on the jetty at the mouth of the Russian River, with an

(Continued on page 24)

Water Supervisor Work to Continue

(Continued from page 23)

appropriation of \$10,000. A small crew will be engaged for a period of three months in the placing of additional rock to strengthen the existing structure. The present appropriation is so small that no actual construction or extension can be accomplished and the work to be done is considered maintenance.

Flood Measurements and Gages.

The mimeographed reports of the flood season data for 1925-1926 and 1932-1933 have been printed and are now ready for distribution.

WATER RIGHTS

Supervision of Applications to Appropriate.

During the month of July, 32 applications to appropriate water were received, 12 were denied and 20 were approved. In the same period 16 licenses were issued.

Among the more important applications received during the month were two by the city of Eureka of which one was to appropriate 400 cubic feet per second and 90,000 acre-feet per annum from Mad River for power purposes at an estimated cost of \$1,200,000, and the other to appropriate 7.7 cubic feet per second and 750 acre-feet per annum from the same stream for municipal purposes at an estimated cost of \$375,000. There were also three large applications for mining purposes, one of which was by T. H. Rosenberger of Forest Hill, California, to appropriate 250 cubic feet per second from North Fork of American River; another by Joseph H. Stephens of Sacramento to appropriate 115 cubic feet per second from East Branch of Monumental Creek, a tributary of North Fork of American River and the other by Wm. H. Taylor, 605 Russ Building, San Francisco, to appropriate 100 cubic feet per second from South Fork of Middle Fork of Yuba River.

Inspections of completed projects were made during the month in Tulare, Kern, San Bernardino, Inyo and Mono counties.

ADJUDICATIONS

Shasta River (Siskiyou County). Action by the court on the motion to tax costs is pending the submission of briefs as ordered at the hearing held before the Superior Court at Yreka, on April 21, 1933.

Whitewater River (San Bernardino and Riverside Counties). Case pending in the Superior Court of Riverside County awaiting developments in regard to the proposed All American Canal from Colorado River.

Clover Creek (Shasta County). The Clover Creek case is pending in the Superior Court of Shasta County awaiting the court hearing, which has been set for September 12, 1933.

Butte Creek (Siskiyou County). Case pending in the Superior Court of Siskiyou County awaiting action by the parties involved.

Eagle Creek (Modoc County). The waters of Eagle Creek were distributed throughout the month in accordance with a schedule of allotments adopted by the water users for the 1933 irrigation season.

South Fork Pit River (Modoc County). The schedule of allotments adopted by the water users for trial distribution during the 1933 irrigation season was administered by a water master throughout the month.

Hat Creek (Shasta County). The stipulation for judgment prepared by the Division is being circulated by counsel among the interested parties.

Deep Creek (Modoc County). The Division's report as referee was filed with the Superior Court of Modoc County on August 18, 1933.

Franklin Creek (Modoc County). The Division's report as referee was filed with the Superior Court of Modoc County on July 27, 1933.

Pine Creek in Surprise Valley (Modoc County). The waters of Pine Creek in Surprise Valley were distributed throughout the month in accordance with the plan for trial distribution adopted for the 1933 irrigation season.

Cottonwood Creek (Modoc County). The schedule of allotments adopted by the water users for trial distribution during the 1933 irrigation season was administered by a water master throughout the month.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

In view of the fact that no provision was made in the budget for continuation of this work, and following the failure of the passage of a special appropriation measure at the July session of the Legislature, the Permanent Committee of the Sacramento-San Joaquin River Problems Conference requested of the Governor and Director of Finance that an appropriation be made from the Emergency Fund to continue the essentials of this work. As a result it was agreed that the State would set up a fund to finance the work for the ensuing fiscal year, provided that by January 1, 1934, the Permanent Committee, the water users and other interests concerned, would furnish guarantees that funds would be raised by them to finance the work for the second half of the biennium. The committee members accepted this proposal and agreed to proceed with plans to obtain the necessary guarantees by January 1, 1934.

The Water Supervisor work will continue to be maintained to the extent possible under the reduced funds which it is estimated should be sufficient to assure the maintenance of the monthly records of stream flow, diversions, and return flow throughout the Sacramento-San Joaquin territory and the salinity and tide gage records in the delta.

Early in August the flow of the Sacramento River at Sacramento dropped to a low of about 1600 second-feet and there has been little subsequent change. During the same period the flow of the San Joaquin River near Vernalis has been about 600 second-feet. Salinity has advanced rapidly in the lower delta channels within the past month and 100 part salinity (100

Topographic Field Work Completed

(Continued from preceding page)

parts of chlorine per 100,000 parts of water) is now in the vicinity of lower Brannan, Twitchell, and Bradford Islands. Present salinity conditions compare closely with those of 1920 and 1929 as shown by the accompanying tabulation giving the salinity on August 10th at upper bay and delta stations in various years.

Salinity on August 10th at Upper Bay and Delta Stations, in Parts of Chlorine per 100,000

Station	Year				
	1920	1926	1929	1931	1932 1933
Point Orient	-----	1870	1720	1860	1620 1720
Bullshead	1420	1610	1320	1610	1120 1060
Bay Point	-----	1190	1040	-----	420 820
O. and A. Ferry	-----	712	1030	660	1320 370 620
Collinsville	-----	518	940	600	1190 *144 420
Antloch	-----	525	730	380	1050 38 300
Emmaton	-----	*217	*268	198	870 *12 159
Jersey	-----	123	400	*174	700 *12 110

*August 6th.

¹ Martinez.

DAMS

To date there have been received 823 applications for approval of dams built prior to August 14, 1929, of which 693 are now under jurisdiction. One hundred sixteen applications have been received for approval of plans for construction or enlargement and 386 for approval of plans for repair, alteration or removal.

Twenty-eight dams are under construction or enlargement and 103 are under repair or alteration. Certificates of approval of 580 dams have been issued to date.

Application Received for Alteration.

Dam	Owner	County
Stoddard Lake	C. L. Carr	Trinity

Plans Approved for Construction.

Dam	Owner	County
Mud Springs	C. M. Wickham	Lassen
Lower White House	Humphrey Estate, Inc.	San Mateo
Distilling Basin No. 6	Cucamonga Basin Protective Association	San Bernardino

FEDERAL COOPERATION

Irrigation Investigations.

In connection with the Federal-State Cooperative Irrigation Investigations, experimental work has continued in the Sacramento-San Joaquin Delta on the consumptive use of water by weeds, tules, and asparagus grown in tanks and on evaporation measurements. Projects under which work has continued in the Santa Ana and Mojave Basins of southern California, include penetration and storage of rainfall, the consumptive use of water by native plants grown in moist areas, and use of water by canyon bottom vegetation. Much of the field work on these projects has been completed and compilations and analyses of the data and results to date will soon be available.

Topographic Mapping.

Field work in connection with Cucamonga No. 1 quadrangle in San Bernardino County was completed during July and progress was made toward the completion of Dixie, Eureka, Hoopa, Lakeport and Sebastopol quadrangles in Shasta, Lassen, Humboldt, Lake and Sonoma counties.

Topographic sheets covering the Kramer Borate District, a mining area in southeastern Kern and western San Bernardino counties are now available. The scale is 1 to 24,000 and the contour interval is 5 feet.

Stream Gaging.

Federal-State cooperative stream gaging work has continued in the recording of stream flow at most of the regular stations throughout the State, although reduced appropriations may require the discontinuance of a number of stations on September 30th, the end of the water year. Maintenance of the "summer" stations on the Sacramento and San Joaquin rivers in the valley, has continued with, however, an enforced reduction in the field work.

WATER RESOURCES

Pit River Investigation (Modoc and Lassen counties).

The final report on the investigation of the Pit River is being published by the State Printer.

South Coastal Basin Investigation.

Investigations in the South Coastal Basin are being continued along routine lines as planned, with a reduced staff.

Ventura County Investigations.

Studies on the cost of spreading water, and work on the preparation of the final report, were continued during the month.

STATE WATER PLAN

The Legislature of 1933 passed two measures, carrying out the recommendations of the Legislative Committee and the Governor's Commission appointed to investigate and report upon the State Water Plan; one, Assembly Constitutional Amendment No. 18, was approved by the Legislature with slight modifications from that proposed in the reports of the Committee and Commission. It will be submitted to the vote of the people in the general election of 1934. In order that funds might be made available to the Central Valley Project under the provisions of the National Industrial Recovery Act of 1933, Assembly Bill No. 259 was passed at the last session of the Legislature and signed by Governor Rolph on August 5, 1933.

"Remember how Mother used to keep the children out of the jam by hiding the keys to the pantry?"

"Yes, and now she does it by hiding the car keys."

Engineers Invent Repositioning Device to Force Pavement Slabs Into Place

By I. S. VOORHEES, District Maintenance Engineer

WITH much pavement distortion and displacement over tidal flats in Orange County, Route 60, all as resulting from the earthquake of March 10, 1933, the question of repairs was an immediate and pressing one. A mudjacking outfit from Sacramento was promptly on the ground, but even after this crew had restored slabs to grade there still remained wide gaps between adjacent slabs extending for lengths of several hundred feet over a distance of 10 miles in the vicinity of Huntington Beach.

There were 15 such areas ranging from 140 to 400 feet in length, and in width from $2\frac{1}{4}$ to $8\frac{1}{2}$ inches. At first these were considered for filling with asphaltic concrete, or later with Portland cement concrete. Temporary repairs were, of course, made with the first named material.

Maintenance Engineer Dennis thought an effort should be made to pull the adjacent slabs together, so plans to that end were set on foot. Since the force that had created the displacement was tremendous, it was self evident that in some way great force must be marshalled for correction. This problem was not so easy but was finally worked out with the aid of Superintendent W. B. Cannon of the District Equipment Department.

AN EXPERIMENTAL JOB

It was obvious from the first that the force to be invoked must bear some relation to the weight of the slab to be moved with proper allowance for friction. The slabs weighed about 50 tons, so steps were taken to develop a force at least that much. The job being experimental without precedents to guide us it was aimed to keep costs down so that if the machine did not work there would not be much loss.

As will be noted from the accompanying pictures, the assembly consists essentially of a rectangle designed for working under the theory of parallel forces. The upper member of the force rectangle was made up of $8\frac{5}{8}$ O.D. 42-lb. well casing, which also served to support the mechanism on the trailer.

The lower member consisted of two pieces of $\frac{5}{8}$ x 8 inch Universal plate approximately 40

feet long, separated at the ends with steel blocks 12 inches square and $1\frac{1}{2}$ inches thick welded in there. The ends of the rectangle were made up of 8 x 8 inch steel billets approximately 50 inches long. Rotating pivots for the movable ends were made of 2-inch nickel steel shafting welded to plates, clamped to the billets.

INCH MOVEMENT PLANNED

The $1\frac{1}{2}$ -inch plate in one end of the lower or tension member was bored to fit the shaft as was also the end of the jack. The bottom pivot fitted over the head of a piece of 80-lb. rail 24 inches long which was placed against the concrete with packing pieces of Oregon pine in order to distribute the load and not fracture the edges of the slabs.

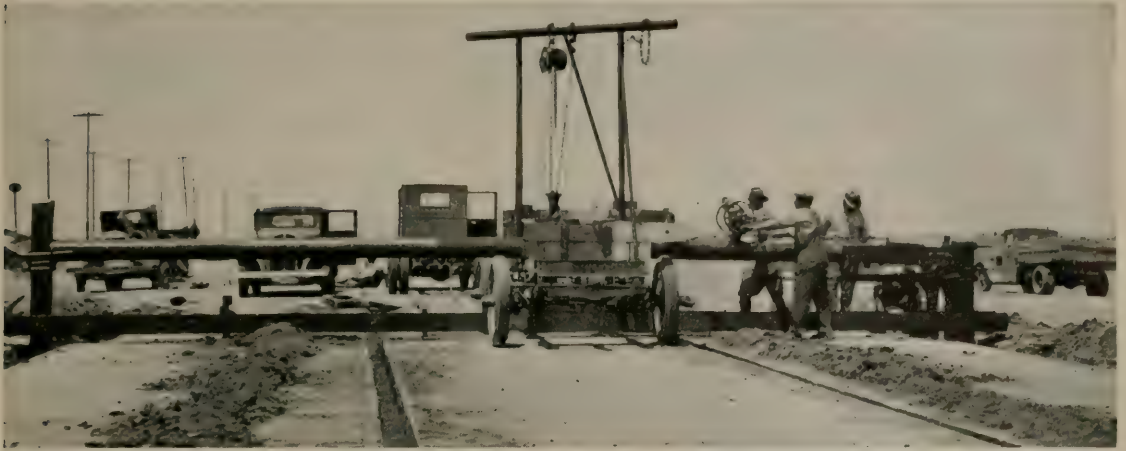
Such filler pieces of wood were particularly essential at the start when the gaps between working ends were approximately 30 feet and were used on both the stationary and movable ends.

As it was uncertain just how far the pavement could be moved at one time without damage, it was planned to give a 4-inch stroke at the pavement and an 8-inch one at the jack, thus securing a 2:1 leverage which aided in the power build-up. As events showed, this proved about right as it permitted movement of the pavement of about 1 inch at each operation, even after making due allowance for crushing of the lumber.

BUILT JACKING DEVICE

The jacking device was built out of a piece of $6\frac{5}{8}$ -inch casing, oil being circulated by a small triplex pump driven by an air cooled engine. A bypass valve was built into the pump, so that by closing the valve, pushing immediately started as the engine ran continuously, and releasing such valve caused the lever to retract. The jack plunger moved at the rate of slightly over an inch per minute so that each push took about five minutes. Moving and setting up consumed a similar period.

A pressure gage was used in order to keep track of performance. It was found that



BIG SQUEEZE DOES THE TRICK—General view of pavement jacking outfit assembly in action forcing disalligned pavement slabs into place with 75- to 90-ton pressures.

pressure would at times go up to 3000 lbs. per square inch without distress. The only trouble experienced was from grit in the oil getting into the bypass valve. Average pressure was 1500 lbs.

At first an effort was made to operate with a hand outfit as shown in the picture, but this proved too slow and laborious, so the triplex pump and aircooled engine were installed.

Pressures ranging from 30 to 50 tons were utilized after the slabs had started moving and 75- to 90-ton pressures were required to start such movement.

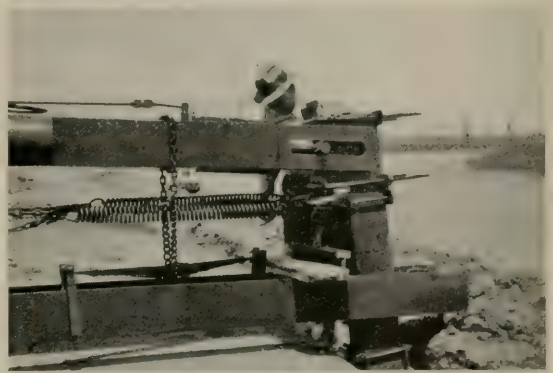
PORTABLE OUTFIT

As the outfit must necessarily be portable, even while working, it was built crosswise on a 2½-ton trailer with compression member above and tension member below the trailer frame. A gallows frame to support chain blocks was built to raise and lower it.

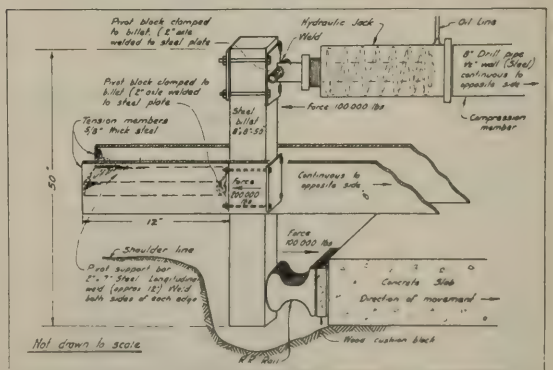
OPERATING PROCEDURE

The cracks between adjacent slabs were thoroughly cleared of all materials to a depth of 2 inches below the concrete, and at each joint in the pavement the shoulder was excavated to subgrade for a length of 3 feet and width of 18 inches. After such preliminary work the machine was lowered until the lower end of the steel billets was on a level with the bottom of the concrete slabs.

The building and operation of the machine covered a period of about four weeks. Pavement alignment was restored at 11 locations where the cracks totaled 3370 feet in length with an average width of 4.47 inches presenting a total area of 139.55 square yards. There was an average of 6.89 square yards of gap



CLOSE-UP view of the working end of device.



ISOMETRIC SKETCH of the movable end of pavement jacking assembly showing details of construction and connections.

closed per day at an average cost of \$6.21 per yard.

The work was done at a net operating cost of \$866.09 of which \$709.90 was for labor and \$156.19 for rental.

Large Projects Budgeted for South

(Continued from page 7)

County	Route	Location	Mileage	Nature of Improvement	Amount
Humboldt—Cont'd					
	1	County Line Bridge and approaches		Bridge, grading, surfacing	23,500
	1	Jordan Creek to S. Scotia Bridge	2.0	Grading and surfacing	128,000
	46	Weitchpec to Happy Camp (portions)		Grading, bridges	31,500
		Total, Humboldt County			\$875,100
Imperial					
	26	Trifolium Canal to 20 ft. pavement	3.2	Grading, paving	\$80,800
	26	San Felipe Wash		Bridge	20,000
	26	Arroyo Salado Tule and Campbell washes, San Felipe Sand Dunes		Grading, paving, bridges	80,700
	26	Trifolium Canal to north boundary	33.0	Surface shoulders	84,800
	27	Holtville to Highline Canal	7.0	Surface shoulders	25,300
	27	Araz to Yuma	6.1	Surface shoulders	6,100
	27	East Highline Canal to Sand Hills	21.0	Shoulder grading and retread	240,000
		Nilan to Mecca (portions)		Grading	27,500
		Total, Imperial County			\$565,200
Inyo					
	23	South limits Bishop to Birchim Canyon	13.1	Grading, surfacing	\$140,000
		Total, Inyo County			\$140,000
Kern					
	4	1 mi. to 2 mi. south of Delano	1.0	Grading, paving	\$37,000
	4	Oak Glen to 1.6 mi. south	1.6	Grading, paving, bridge	258,000
	23	Lancaster to Mojave	24.0	Surfaced shoulders, widen grade	37,500
	57	Maricopa to west boundary	10.5	Grading, surfacing	250,000
	58	Haypress Canyon to Bear Mountain Ranch	6.0	Grading, surfacing	448,125
		Taft-Greenfield Road to Route 33 (portions)		Grading and surfacing	55,000
		Total, Kern County			\$1,085,625
Lake					
	49	Middletown to Twin Bridges (portions)		Grading, surfacing, bridge	\$186,000
		Total, Lake County			\$186,000
Los Angeles					
	60	Los Angeles west city limits to Beverly Blvd.	0.6	Grading, paving	\$100,000
	60	West Channel Road to Santa Monica	0.2	Grading, paving	20,000
	4	Santa Clara River to Castaic School	5.4	Grading, paving	140,000
	23	Lancaster to Mojave	24.0	Surfaced shoulders, widen grade	37,500
	9	Big Tujunga Wash to Tujunga	3.3	Grading, paving, bridges	114,000
	4	Near Newhall to Saugus	3.2	Grading, paving, bridge	75,000
	23	The Oaks to Acton Road	10.6	Paving	152,000
	23	Saugus to Williams Ranch (portions)	0.6	Grading, paving, bridge	37,000
	23	Williams Ranch to Seeley's Ranch (portions)	1.4	Grading, paving	70,000
	60	Encinal Canyon to Little Sycamore Creek	5.6	Grading, paving, bridges	80,500
	26	Orange Ave. to Barranca St.	4.0	Grading, paving	157,000
	26	At El Monte		Grade separation	90,000
	26	Atlantic St. to Los Angeles	3.4	Grading, paving, bridges	350,000

Improvements Provided Along Coast

(Continued from preceding page)

County	Route	Location	Mileage	Nature of Improvement	Amount
Los Angeles—Cont'd					
	61	Colby Canyon to Mt. Wilson Road	4.0	Grading, surfacing	400,000
		Manchester Ave. Route (portions)		Grading and paving	150,000
		Route 4 to Route 60, Sepulveda Blvd. Rte. (portions)		Grading and surfacing	150,000
	60	{ Long Beach- (city)		State Street, N and O Streets	400,000
		{ Los Angeles		Wilmington	
	60	Santa Monica (city)		Lincoln Blvd.	300,000
	9	Los Angeles (city)		San Fernando Road, Route 4 to Foot-hill Blvd.	275,000
	26	Los Angeles (city)		Ramona Blvd., extension to Aliso St.	350,000
	2	Los Angeles (city)		Sunset Blvd. at Glendale Ave., separation	145,000
	2	Montebello (city)		Whittier Blvd	50,000
				Total, Los Angeles County	\$3,643,000
Madera					
	4	Ash Slough		Bridge	\$40,000
		Fresno to Yosemite Park		Grading, surfacing (portions)	150,000
				Total, Madera County	\$190,000
Mariposa					
	18	Orange Hill School to Mariposa	15.0	Surfacing and shoulder grading	\$215,000
Mendocino					
	1	Rattlesnake Bridge No. 3 and approaches	0.6	Bridge, grading, surfacing	\$66,800
	1	County Line and approaches		Bridge, grading, surfacing	23,500
	1	Cloverdale to Hopland	13.8	Grading, surfacing, bridges, grade separations	420,000
	48	MacDonald to Navarro (portions)		Grading, surfacing, bridges	50,000
				Total, Mendocino County	\$560,300
Merced					
	32	West Boundary to foot of Pacheco Pass grade	3.3	Grading, surfacing	\$260,000
	32	Santa Rita Slough		Bridge, grading, paving	29,000
				Total, Merced County	\$289,000
Modoc					
	28	Alturas to Cedarville	2.6	Grading, surfacing (portions)	\$81,000
Mono					
	23	Crestview to 2.2 miles south of Rush Creek	9.8	Grading, surfacing	\$181,000
	23	Sherwin Hill to Whiskey Creek	3.5	Grading, surfacing	35,000
	23	Point Ranch to Dressler's Corner	6.3	Grading, surfacing	116,700
	23	Mono Inn to 2.7 mi. south	2.7	Grading, surfacing	63,500
				Total, Mono County	\$396,200
Monterey					
	56	Prison labor camps (secondary)		Grading	\$780,000
	2	Chular to 6 miles south of Gonzales (portions)		Grading, paving	167,600
	2	King City to Greenfield	11.1	Grading, surfacing	125,000
	56	Carmel to Carmel River	1.5	Grading, surfacing, bridge	101,000
	56	South Boundary to Molera Ranch		Bridges	307,500
	56	Big Sur to Molera Ranch	4.7	Grading	170,000
	10	San Lorenzo Creek to Priest Valley School (portions)		Grading	150,000
				Total, Monterey County	\$1,801,100
Napa					
	7	1 mile north of Carquinez Bridge to Cordelia	12.5	Grading	\$59,000
				Total, Napa County	\$59,000

(Continued on page 30)

Sacramento Area Gets New Bridge

(Continued from page 29)

County	Route	Location	Mileage	Nature of Improvement	Amount
Nevada	37	Yuba River to Soda Springs	11.0	Surfacing	\$12,500
	38	Hinton to 5 miles easterly	5.0	Surfacing (portions)	18,000
	15	1 mile west of Washington			
		Road to $\frac{1}{2}$ mi. E. Summit	7.4	Surfacing	110,000
	15	Spaulding Canal to Route 37	4.1	Grading, surfacing	63,500
Total, Nevada County					\$204,000
Orange	2	Trabuco Creek		Bridge	\$26,000
	60	"The Arches" at Newport			
		Beach		Grade separation	180,000
	43	Santa Ana Canyon			
		(portions)		Grading, paving	200,000
Bauro Street					52,300
Total, Orange County					\$458,300
Placer	17	Loomis to Newcastle	5.2	Grading, paving	\$252,000
	37	Yuba River to Soda Springs	11.0	Surfacing	12,500
	15	Spaulding Canal to Route 37	4.1	Grading, surfacing	126,500
	38	Ward Creek and approaches		Bridge and grading	14,000
Total, Placer County					\$405,000
Plumas	21	Prison labor camps			
		(primary)		Grading	\$590,000
	21	Oroville to Quincy			
		(portions)		Grading	183,200
	21	North Fork Feather River		Bridge	22,400
Total, Plumas County					\$795,600
Riverside	26	Banning to Whitewater	12.1	Repair dips	\$100,000
	64	Black Butte to Blythe	9.3	Widening surfacing, base reinforcement	50,400
	26	South Boundary to Ave. 62	14.3	Surface shoulders	21,800
	64	Near Shaver's Summit			
		westerly	12.0	Oil surface	30,000
				Interest, purchase of bridge (State's share)	9,375
	64	Colorado River Bridge			300,000
	64	Indio to 12.5 miles easterly	12.5	Grading, surfacing	42,500
	77	South Boundary to Corona	45.0	Surface shoulders	25,000
	78	Elsinore to Box Springs			
		grade	25.0	Surface shoulders	650,000
	19	Beaumont to Riverside			
		(portions)		Grading, surfacing structure	27,500
		Nilan to Mecca (portions)		Grading	
Total, Riverside County					\$1,256,575
Sacramento	3	American River, 16th Street		Bridge	\$150,000
	4	Sacramento to McConnell		Bridges	27,000
	6	Sacramento (city)		"M" Street Bridge	108,000
Total, Sacramento County					\$285,000
San Bernardino	26	San Timoteo Creek and			
		approaches		Bridge, grading, paving	\$37,300
	26	Sierra Ave. to 2 miles west			
		of Colton	3.8	Grading, paving	150,000
	26	Ontario to Pomona	2.1	Grading, paving	110,000
	59	Camp Cajon to West			
		Boundary	18.0	Grading, surfacing	240,000
	43	San Bernardino to Arrow-			
		head Springs	1.0	Grading, surfacing	40,000
		Cajon Pass to Randsburg			
		(portions)		Oiling	25,000
	26	Redlands (city)		Central Avenue Route	100,000
	9	San Bernardino (city)		Fourth Street entrance	30,324
Total, San Bernardino County					\$732,624

Approaches for Bay Bridge Included

(Continued from preceding page)

County	Route	Location	Mileage	Nature of Improvement	Amount
San Diego	2	Del Mar to Oceanside	16.4	Grading, paving, bridge	\$535,000
	2	Santa Margarita		Bridge	200,000
	12	El Cajon easterly	1.2	Grading, paving	28,000
	2	San Ysidro to National City	10.0	Grading, paving	285,000
	2	Oceanside (city)		South entrance	40,000
Total, San Diego County					\$1,088,000
San Francisco	68	San Francisco Bay Bridge approaches		Grading, paving, structures	\$1,650,000
	68	(San Francisco (city)		Federal aid connections on Routes 2 and 68, in city	600,000
	2				
Total, San Francisco County					\$2,250,000
San Joaquin	53	Lodi to Rio Vista (portions)		Grading, surfacing	\$100,000
Total, San Joaquin County					\$100,000
San Luis Obispo	2	Pismo to San Luis Obispo (portions)	2.1	Paving	\$77,500
		Morro Bay to Atascadero (portions)		Grading	100,000
Total, San Luis Obispo County					\$177,500
San Mateo		Skyline Blvd. to Half Moon Bay (portions)		Grading, surfacing	\$73,000
		Junipero Serra Blvd. (portions)		Grading, paving	300,000
		Sharps Park to San Francisco (portions)		Grading	100,000
	2	Daly City (city)		Daly City to Colma (Mission Street)	300,000
	2	Palo Alto (city)		Mayfield (5 blocks)	50,000
Total, San Mateo County					\$823,000
Santa Barbara	2	Arroyo Honda to Gaviota	5.3	Grading, paving	\$315,000
	2	Tajiquas to Arroyo Quemado	1.4	Grading, paving	60,000
	2	Nojoqui Grade	3.7	Grading, paving, bridge	479,000
	2	Hollister Ave. Subway to Santa Barbara	1.6	Grading, paving	113,800
	2	Ortega Hill and San Ysidro Road to Santa Barbara	1.9	Grading, paving	147,000
	80	Santa Barbara to San Marcos Pass	5.7	Grading, structures	500,000
	80	Santa Ynez River-Santa Agueda Creek, bridge and approaches		Bridge, grading, surfacing	150,000
	2	Santa Barbara (city)		Through routes (city truck route)	130,000
Total, Santa Barbara County					\$1,894,800
Santa Clara	68	Lawrence Station Road to Alviso-Santa Clara Road	2.6	Grading, paving, structures	\$240,000
	2	Gilroy (city)		Monterey Street	15,000
Total, Santa Clara County					\$255,000
Santa Cruz	5	Inspiration Point to Scott Valley	6.7	Grading, surfacing	\$265,500
	5	Santa Cruz (city)		East entrance	52,000
Total, Santa Cruz County					\$317,500
Shasta	3	Redding to Sulphur Creek	1.0	Bridge, grading, surfacing	\$178,000
	28	Diddy Hill to Montgomery Creek	16.2	Surfacing	55,000
	28	Ingot to Ashers (portions)	4.0	Grading, surfacing	100,000

(Continued on page 32)

American Canyon Cut-off Listed

(Continued from page 31)

County	Route	Location	Mileage	Nature of Improvement	Amount
Shasta—Cont'd					
	20	Shingletown-Viola (portions)	11.5	Grading	\$26,500
	3	Redding (city)		Sacramento River Bridge and approach	124,000
				Total, Shasta County	\$483,500
Sierra	25	Nevada City to Downieville		Grading (portions)	\$30,000
Siskiyou	3	At Big Canyon	0.8	Grading, surfacing	\$86,500
	46	Weitchpec to Happy Camp		Grading, bridges (portions)	31,500
		Fort Jones to Route 3		Grading (portions)	50,000
		Yreka (city)		Main Street	90,000
				Total, Siskiyou County	\$258,000
Solano	7	1 mi. north Carquinez Bridge to Cordelia	12.5	Grading	\$400,000
	7	5.5 mi. north Fairfield to 1 mi. south of Vacaville		Grading, paving, bridge	172,000
	7	Cordelia	3.3	Underpass	40,000
		Liberty Island Road		Surfacing	25,000
				Total, Solano County	\$637,000
Sonoma	1	Cloverdale to Hopland	13.8	Grading, surfacing bridges, grade separation	\$130,000
	8	Foster Line Change	0.9	Grading, surfacing	60,000
				Total, Sonoma County	\$190,000
Stanislaus	4	½ mi. south to ¾ mi. north of Turlock	1.3	Grading, paving	\$65,000
	4	Modesto (city)		Ninth Street	70,000
	4	Turlock (city)		"Front Street Route"	35,000
				Total, Stanislaus County	\$170,000
Sutter		Tisdale Weir Bridge		Bridge	\$15,000
				Total, Sutter County	\$15,000
Tehama	29	Red Bluff to Dales (portion)	8.5	Grading, surfacing	\$265,000
	3	Red Bluff (city)		North entrance	50,000
				Total, Tehama County	\$315,000
Trinity	20	Prison labor camps	10.3	Grading	\$250,000
	20	South Fork to Burnt Ranch		Grading, surfacing (portions)	123,500
	20	Over Oregon Mountain		Grading	100,000
				Total, Trinity County	\$473,500
Tulare Ventura	10	Visalia to Merryman	9.9	Grading, paving, bridges	\$340,000
	2	Ventura to West Boundary	12.0	Grading, paving	\$672,000
	60	Calleguas Creek		Bridge	46,000
	2	Station 110 to Santa Clara River	3.4	Grading, paving	72,000
	60	Encinal Canyon to Little Sycamore Creek	5.6	Grading, paving, bridges	161,000
	80	Casitas Pass (portions)		Grading	150,000
	2	Ventura (city)		Meta Street (complete shoulders)	35,000
				Total, Ventura County	\$1,136,000
Yolo	6	At Sacramento	50	Bridge	\$325,000
	50	Rumsey to Route 15 (portions)		Grading, bridge	87,500
		Liberty Island Road		Surfacing	25,000
				Total, Yolo County	\$437,500
Yuba	3	Wheatland to Morrison's Crossing	2.5	Grading, paving, bridges	\$94,400

STATE OF CALIFORNIA

Department of Public Works

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EARL LEE KELLY-----Director
ERIC CULLENWARD-----Deputy Director
MORGAN KEATON-----Assistant Deputy Director

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E. R. HIGGINS, Comptroller

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R. E. PIERCE, District X, Stockton
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Eleventh and P Streets, Sacramento, California

DIVISION OF WATER RESOURCES

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J. J. HALEY, Jr., Administrative Assistant
HAROLD CONKLING, Deputy in Charge Water Rights
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R. L. JONES, Deputy in Charge Flood Control and Reclamation

GEORGE W. HAWLEY, Deputy in Charge Dams
SPENCER BURROUGHS, Attorney
EVERETT N. BRYAN, Hydraulic Engineer, Water Rights

A. N. BURCH, Irrigation Investigations
H. M. STAFFORD, Sacramento-San Joaquin Water Supervisor
GORDON ZANDER, Adjudication, Water Distribution

DIVISION OF ARCHITECTURE

GEO. B. McDUGALL, State Architect, Chief of Division
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HEADQUARTERS

H. W. DEHAVEN, Supervising Architectural Draftsman
C. H. KROMER, Principal Structural Engineer
CARLETON PIERSON, Supervising Specification Writer
J. W. DUTTON, Principal Engineer, General Construction
W. H. ROCKINGHAM, Principal Mechanical and Electrical Engineer

DIVISION OF CONTRACTS AND RIGHTS OF WAY

C. C. CARLETON, Chief
HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

O R E G O N

CENTRAL VALLEY PROJECT OF STATE WATER PLAN

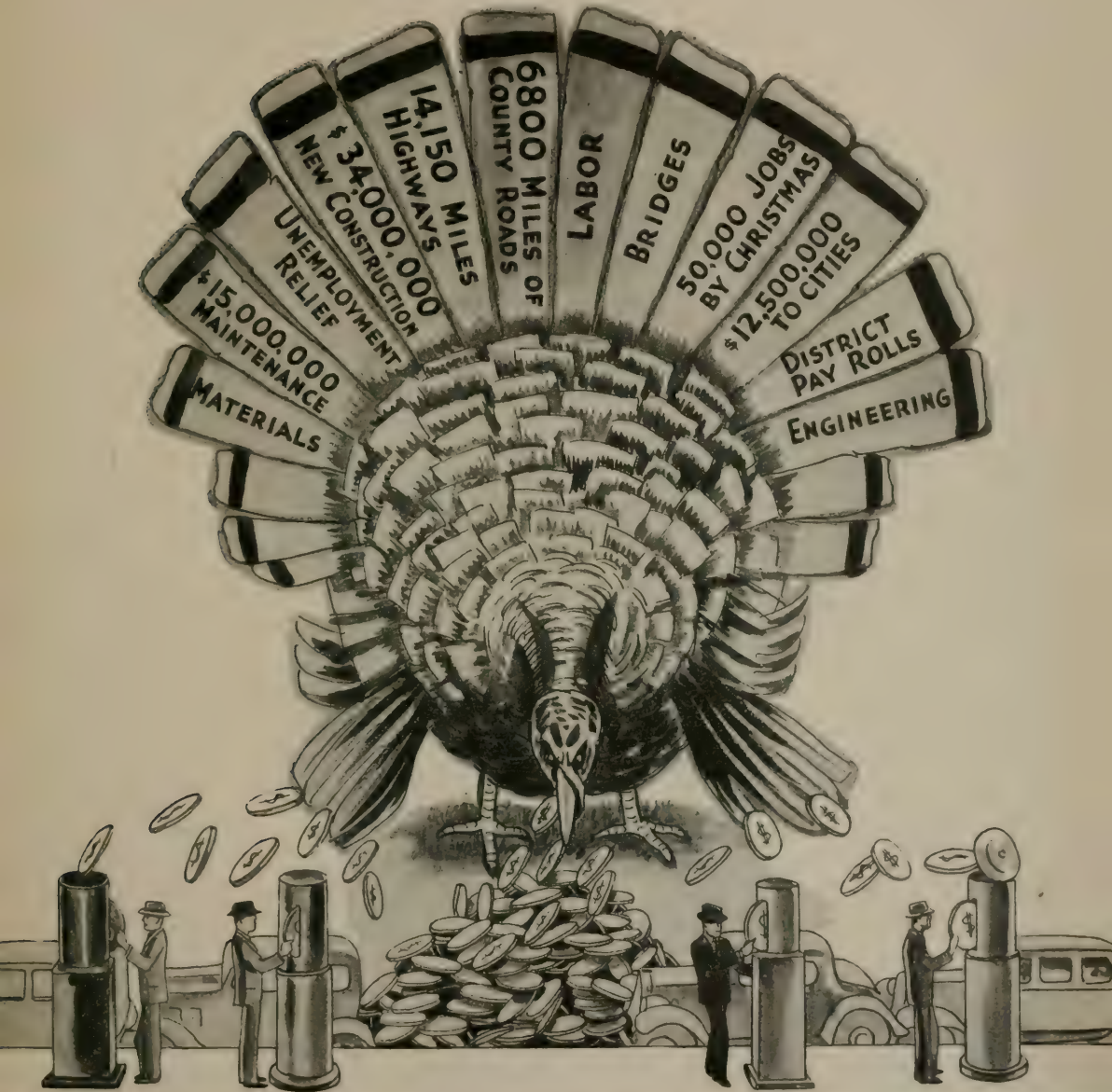
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CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



Official Journal of the Department of Public Works
OCT.-NOV. 1933

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Governor Rolph Urges Voters to Save Water Plan Benefits for State

In earnest appeal he declares its defeat would be tragedy involving prosperity of commonwealth and work for 25,000. Can never cost taxpayers a cent

By JAMES ROLPH, JR., Governor of California

I APPEAL to you, my fellow Californians, in behalf of a project which is your project, which is for your benefit and your prosperity, and which you must approve or reject at the polls on December 19, 1933. Upon that date a glorious chapter in the annals of California history will be written, if, as I confidently expect, you meet the challenge to our future happiness and welfare to which determined opposition has thrown down the gage of battle.

As your Governor I have first and last, steadfastly and vigorously, lent every assistance possible within my power to further a practicable solution of that dire necessity for an adequate water supply which now imminently threatens to stifle and destroy existing California agricultural and industrial developments of great extent and value, ruin thousands of our citizens, depopulate cities, towns and villages, and bring within its wake a distress and despair to all of California which is indeed a challenge to our manhood and our womanhood and which I know that you, my fellow Californians, will not permit to go unanswered.

Words fail to portray the crisis in our affairs with which we are now faced. Surrender is ruin; action is our only salvation. Fortunately for sixty years, Californians in

places of leadership have anticipated the time when this issue of a water supply would brook of no more delay, and for the past twelve years State and National agencies, legislators, congressmen, and leading citizens have cooperated in preparing for the day now arrived.

Doubly fortunate, are we, that a plan carefully and thoroughly developed as the result of years of intensive labor by the best talent within our country, comes to fruition at this time and also coincidentally with a grave National economic crisis which must be conquered; fortunate because the need for more adequate water supplies is now acute; fortunate because the adoption of this plan by the people of California will give relief by employment to 25,000 or more workers for the next three years, a livelihood for 100,000 persons and present a project ideal in character for N. R. A. adoption and financing.

Therefore, I urge you to support the plan and project pro-

vided for in the "Central Valley Project Act of 1933," Chapter 1042, Statutes of 1933, A. B. 259, which act, passed by the Legislature on July 26, 1933, and approved by me on August 5, 1933, would have become a law on October 25, 1933, had it not been prevented from taking effect on that date by the filing of a referendum petition.



JAMES ROLPH, Jr.

New Ridge Alternate Highway Opened After 4 Years' Work. Cost \$2,864,000

By R. C. MYERS, Assistant Engineer

THE culmination of more than four years of active construction endeavor was marked on October 29, 1933, by the opening of the Ridge Route Alternate new super highway, which is to supplant the already famous Ridge Route between Los Angeles and Bakersfield.

Thousands of interested spectators gathered at the "Channel Change" about midway between Gorman and Castaic, where, with fitting ceremony, Harry A. Hopkins, Chairman of the California Highway Commission, formally accepted this new highway on behalf of the State in the name of Governor Rolph.

A multitude of cars were waiting at Castaic and at Gorman where the barriers were removed simultaneously at 10 a.m. and two long caravans were formed, one coming from the north and the other from the south, meeting at the "Channel Change," the location selected for the dedication.

NOTABLES INTRODUCED

Alfred Harrel, Bakersfield publisher, on behalf of the Kern County Chamber of Commerce, acted as Master of Ceremonies, introducing Mr. Hopkins, representing Governor Rolph; State Highway Commissioners Phillip Stanton and F. A. Tetley; Chief Engineer E. E. East, of the Automobile Club of Southern California; Assistant State Highway Engineer G. T. McCoy; District Engineer S. V. Cortelyou of District VII of the State Division of Highways, who was in active charge of the work; John R. Quinn, chairman, and Roger Jessup, member of the Los Angeles County Board of Supervisors; J. Perry Brite, chairman of the Kern County Board of Supervisors; President William A. Simpson, of the Los Angeles Chamber of Commerce, and Ferd Snyder and L. B. Nourse of Kern County Chamber of Commerce.

Music for the occasion was furnished by the bands of Taft Junior College and High School, Bakersfield Junior College, and Roosevelt High School of Los Angeles. L. B. Nourse, Secretary of the Kern County Chamber of Commerce was chairman of the committee on arrangements.

Chairman John R. Quinn of the Los

Angeles County Supervisors and J. Perry Brite, chairman of the Kern County board, explained the benefits to their respective communities that will result from the new highway.

OLD QUESTION ANSWERED

Chief Engineer E. E. East of the automobile club and State District Engineer S. V. Cortelyou spoke on the technical phases of the project.

Mr. East explained one of the reasons why it was not feasible to construct the original Ridge Route along the location of the new highway. He said:

"In 1912 the State engineers made a thorough investigation of the Piru Canyon route as well as all other possible locations for a Los Angeles-San Joaquin Valley State highway. The selection narrowed down to a choice between the Piru Canyon and the Ridge. At that time the floor of the canyon could not be considered because of certain water rights then held to be of importance and the proposal to build a large dam and storage reservoir in this canyon where the road was to go. Under conditions as then existing the Ridge offered the best practical location."

The closing act of the official ceremony was the cutting of a barrier of blue and gold ribbons across the new highway by Chairman Hopkins, releasing to public service one of the greatest units of mountain highway in the country.

CHANNEL CHANGE ECONOMY

Ceremonies were conducted at an appropriate spot where Piru Creek has been diverted from its natural course in a concrete-lined channel which was constructed to avoid building two bridges across this creek. The building of this new channel instead of two bridges saved the State \$75,000.

This study was a typical one of many studies which were made in the location and construction of this highway. The first consideration was always that high standards of alignment and grade should be maintained

(Continued on page 16)



Rugged canyon scenery abounds in Piru Gorge on new Ridge Alternate Highway.

No. 1—Looking south toward Pyramid Rock in the "Big Cut" where 252,000 cu. yds. of rock were moved in cutting a path through a mountain ridge.

Nos. 2 and 3—Bits of the old Ridge Route, showing by way of contrast some of its 1000 sharp curves.

No. 4—One of the four bridges over Piru Creek.

No. 5—Scene near "Channel Change" at entrance to Piru Gorge.

Dangerous Viaduct at San Bernardino to be Replaced by Modern Structure

By **GLENN L. ENKE**, Associate Bridge Designing Engineer

A CONTRACT was awarded October 2, 1933, for reconstruction of the Mount Vernon Avenue viaduct in the city of San Bernardino over the tracks of the A., T. & S. F. Railway at a cost of \$189,985.20, thus inaugurating the beginning of an improvement that has long been felt necessary by all users of States routes 9 and 26 to points in southern California, south of San Bernardino.

Alignment of the present viaduct is especially poor, providing practically a right angle turn at its highest point above ground with only 21 feet width between curbs throughout. The existing structure, in addition to being wholly inadequate for modern highway loads, has been the scene of several fatalities, the last one occurring in April, 1932, in which an elderly couple from Seattle, in negotiating this turn, skidded through the top rail in the southwest corner of the viaduct into the railroad yard thirty feet below.

CUTTING A NEW STREET

In preparing the new alignment care was taken to secure easy access to the viaduct at each end by using a flared approach as large as right of way limitations would permit. It was found necessary to use a 6.725 per cent grade at the south end for a short distance to secure sufficient elevation over track No. 46, a Santa Fe freight loading track, to provide the necessary 22 feet clearance required by the State Railroad Commission. Paving at each of the flared approaches constitutes a real problem in securing a smooth transition onto the ramp that will not interfere with automobile operation over existing street grades on Second and Fourth streets.

As part of this improvement, it was necessary to construct a new street cutting diagonally across to Third Street, some distance east of Mount Vernon Avenue and reroute the Pacific Electric tracks from Third to Second Street, thus eliminating interference with the south approach ramp.

This track is located directly on center-line of the new street and connects with the

original track along Third Street. As construction of the south end of the viaduct proper must be delayed until this preliminary work is complete and trains in operation, a separate contract was let on September 15 to perform this work, which is now under way.

UNDERPASS PROVIDED

The structure proper is made up of 19 spans of lengths varying from 25 feet to 88 feet, 9 inches over the tracks, consisting of reinforced concrete deck supported on steel beams and girders that in turn rest on steel floor beams and columns at each bent, and at the south end a 3-span continuous rigid frame built of reinforced concrete. The latter structure provides an underpass at Third Street and was selected because of its inherent value in providing the maximum headroom available at this point, in addition to the pleasing architectural lines secured by this type of construction.

Two 3-foot 6-inch sidewalks are provided on either side of a 40-foot width roadway that flares into the approaches described above, and a concrete railing of plain design broken at varying intervals by ten concrete light standards on either side complete the viaduct and lend an artistic finish to the entire structure.

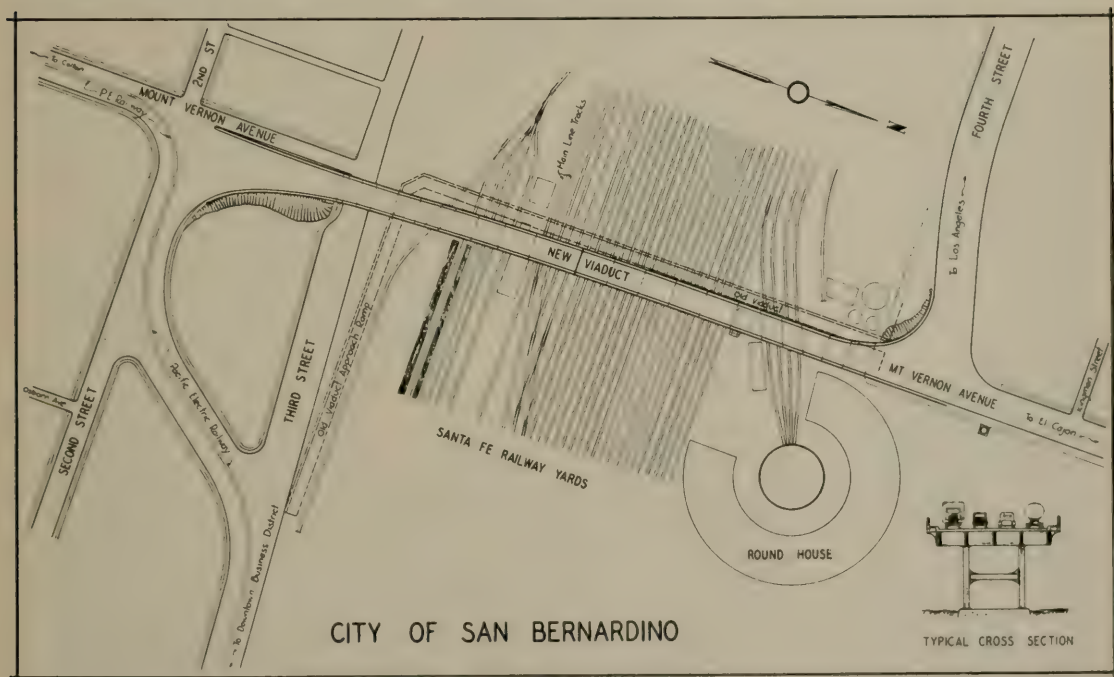
The concrete light standards are worthy of note, being an original modernistic design by T. K. May of the Bridge Department that are to be used for the first time on this viaduct.

BUILT ON OLD FILL

The viaduct is supported partly by an old fill placed in 1883 when the original Santa Fe Railroad yard was built, and as a consequence contains widely varying foundation conditions. Three test pits sunk indicated low bearing value of the soil with possibilities of quicksand at lower depths dependent upon local ground water elevations. Because of these conditions a pile foundation remained the only logical choice and Douglas fir creosoted piles approximately 25 feet long were finally selected to be used throughout the structure with excep-



A DANGEROUS KINK or right angle turn in the narrow old viaduct carrying the State Highway over the Santa Fe yards at Mount Vernon Avenue in the city of San Bernardino has been the cause of traffic fatalities. The above view shows the existing crooked viaduct which will be replaced by a wider modern structure on an alignment indicated by the white dotted line.



FLARING APPROACHES giving safe and easy access to the viaduct proper mark the plans of the new structure. The general arrangement is shown above with approaches in relation to the railroad yard. Position of the existing old viaduct is shown by dotted line.

tion only of a small portion of retaining wall at each end of the viaduct because of their low height and correspondingly low bearing loads and the pier under bent No. 16.

Design of this pier was complicated by interference with a concrete building used as an oil supply house by the Santa Fe Railroad. Cost studies indicated it far too expensive to move and piles could not be

driven underneath it except at a prohibitive expense, so a spread footing will be built 20 feet below ground on a strata of coarse gravel.

In further regard to foundation difficulties, an underground Edison Company concrete conduit carrying two 11,000-volt lines interferes somewhat with piers in the north half of the structure together with a

(Continued on page 19)

25,000 Attend Barbecue Celebrating Opening of Maricopa-Ventura Highway

CUYAMA VALLEY now has a "window" on the sea, and the great lower San Joaquin Valley is given a direct outlet to the Ventura and Santa Barbara coast area by the completion and formal opening on Saturday, October 22d, of the Maricopa-Ventura Highway, officially designated as Joint Highway District No. 6.

A dream of 45 years ago has come true. As early as 1890 a survey was made for a trail across the Pine Mountain range from Ventura into Cuyama Valley: In 1891 a line for a wagon road was run and in 1911 the desire of the Kern County people to get out to the coast in Summer time materialized in the organization of the Good Roads Club by citizens of Maricopa and Taft for the purpose of securing such a transmountain highway.

The movement had the support of J. I. Wagy, now State Senator, and other prominent civic leaders of the three counties, including Harry A. Hopkins, now chairman of the California State Highway Commission.

THREE COUNTIES COOPERATED

A Joint Highway District was formed under the State law in 1926 whereby Kern, Santa Barbara and Ventura counties cooperated with the State and Federal government in the new road enterprise, and the Joint Highway District organization deserves credit for the final achievement in the face of great financial difficulties.

With the Coast Route 40 miles to the west, the Ridge Route 30 miles to the east and no other intervening roads, this new highway makes a great saving in mileage between valley and coast and crosses one of the most rugged sections of the Coast Range.

It leaves the Maricopa-Santa Maria State Highway at its entrance to the Cuyama Valley and follows the valley 20 miles to Ozena, then crosses the Pine Mountain Range into Sespe River Valley, thence down the river through Sespe Gorge to Cold Springs where it climbs over the Topatopa Mountain range and down the north fork of the Matilija River through Wheeler Gorge to Ojai Valley. Thence it follows the Ventura River to the city of Buena Ventura on the Coast Highway.

CROSSES MOUNTAIN BARRIER

The total length of the new highway is about 70 miles. It takes the shortest practicable route across the mountain barrier which is divided into two summits by the Sespe Canyon running parallel with the range. It opens up a large and scenic area of virgin country hitherto inaccessible except by pack outfits.

Pine Mountain is crossed at an elevation of 5000 feet and Topatopa Mountain at 3700 feet. The Sespe Valley, which is followed for 8 miles, ranges from 3500 to 4500 feet elevation. All but the southern 20 miles, which is near the coast, and the northern 10 miles, is above 3000 feet elevation and can qualify as scenic mountain road. The width of the roadway is 20 feet of travel way, with alignment and grade on mountain standards consistent with such rugged country.

CASITAS PASS CONNECTION

A connection is being built with the Casitas Pass State Highway that will permit access to the Coast Highway near Carpinteria.

The estimated total cost for the whole project approximates \$1,500,000.

The Joint Highway District constructed the section from Pine Mountain to the northern terminus, a distance of 26 miles, and the 23 miles from Pine Mountain south were constructed by the United States Bureau of Public Roads as a cooperative project financed from Federal Forest Highway funds and county and State money in the Joint Highway District.

The last project completed by the Bureau of Public Roads a few days ago before the official opening, comprised the grading of 17.3 miles in Santa Barbara National Park from a point 67.4 miles north of Wheeler Springs on the summit of the divide between Sespe Creek and the north fork of Matilija to a connection with the existing tri-county road on Pine Mountain, at an estimated cost of \$600,000. A portion of the work was through rugged, steep country and involved heavy construction. Eight major bridge structures costing \$70,533 were included in this section, one of them a 260-foot reinforced concrete girder type bridge over Sespe Creek.

(Continued on page 28)



MOUNTAIN CLIMBING is made easy for motorists on the new Maricopa-Ventura highway opened with a big barbecue celebration on October 22d. In traversing 70 miles from Cuyama Valley to the coast, it crosses two high mountain ranges. The ascent of the Topatopa range from Matilija Canyon up to the pass into Sespe Canyon is shown in the panoramic scene, No. 1 at top. No. 2—Shovel at work on steep slope. No. 3—Contractor's camp, that housed 250 men. Nos. 4-5—Portions of the new road that required numerous heavy cuts.

State Highway Officials of Nation in Convention Act on Urgent Problems

The American Association of State Highway Officials, composed of State Highway Engineers and other State officials concerned in highway work, represents a cross-section of the latest thought on highway problems. Their conclusions concerning gasoline tax, feeder roads, signs, hours of employment, etc., are reported in the following article by a member of the California delegation.

By HARRY A. HOPKINS, Chairman California Highway Commission

THE nineteenth annual convention of the American Association of State Highway Officials was held in Milwaukee, Wisconsin, October 9-11, with forty-four states and the U. S. Bureau of Public Roads represented, with President Charles H. Moorefield, State Highway Engineer of South Carolina, presiding.

California was represented by Earl Lee Kelly, Director of Public Works; Charles H. Purcell, State Highway Engineer, and the writer. The latter is a member of the Administrative Committee and Mr. Purcell is on the Executive Committee.

The annual report of Executive Secretary W. C. Markham contained so many interesting facts and so much important data that I regret space does not permit mentioning all of them. One pertinent statement in his report reads: "It's a fine-woven rhetorical expression to talk about individual initiative and control, and the kingly qualities exemplified in local self government, but the public has finally learned that state management of highway transportation is just as essential in providing for a continued and economic flow of traffic as it is for Uncle Sam to have the job of carrying a letter from Portland, Maine, to Portland, Oregon."

The total mileage on the State systems is now 372,661, of which pavements of all kinds total 108,430 miles.

FIFTY PER CENT SURFACED

Fifty per cent of the highways on the State systems have a dustless surface or better. Seventeen per cent of all rural highways outside of the State systems have some kind of surfacing.

During the month of July, 1933, there were employed on the State systems 321,535 people and under Federal control in forests and parks 10,252, making a grand total of 331,787. In

comparison to the respective states the average employment for the entire country was one person for every 399 people in the United States.

In view of the fact that none of the Federal funds under the National Recovery Act that provided for \$400,000,000 to be used by State highway departments were in effect when the above figures were prepared it is assumed that the work was performed on an eight-hour basis. Had the thirty-hour provisions in the National Recovery Act been effective it is safe to say that three times as many people would have been employed.

T. H. MacDonald, Chief of the Bureau of Public Roads, discussed in an interesting and informative way "What the State Highway Departments Hope to Accomplish With \$400,000,000." Papers were read and slides shown of construction work on both bridges and highways by speakers from each of the four districts of the country.

IMPORTANT DISCUSSIONS.

Following this symposium, an address by Wilbur J. Watson, architect and engineer, on "Bridges and Civilization," covered history, showing man's first adventures when he used fallen trees across a river as a first step toward the cantilever type of bridge construction. Every type of bridge construction and most of the important bridges of the world were shown by slides with a most interesting description.

While the most outstanding engineers, members of State highway departments and representatives of the U. S. Bureau of Roads presented papers and talks that were most interesting and valuable, it remained for the group meetings to present subjects of vital importance to every phase of work in connection with highway development.

One group covered legal affairs and the matters discussed under this head were rights

By-Passing of Cities Approved at National Highway Convention

(Continued from preceding page)

of way on public domain; through power site reserves over private lands; utilities located along rights of ways; power of eminent domain, whether State or county should exercise this power; commercial vehicles and inter-state commerce; laws, regulations or policies in connection with activities of contractors as well as materials and supplies and many other important phases that legal departments have to interpret.

TRAFFIC LINE GREATEST AID

Traffic control and safety was one of the important group discussions covering uniform traffic regulations as well as standardization of signs and signals. The cooperation of the U. S. Bureau of Roads with the association committee has determined definite practices and recommendations as to visibility of signs. This report also covered cost, financing, regulation, etc.

Another important subject discussed by this group was the use of center and lane line markings. There was not any doubt but that center line marking is the greatest aid to the traveling public and is the means of reducing hazards and the protection of life and property.

Protection at railroad crossings, junction signs, control of roadside industries and structures and billboards versus safety were subjects that had the consideration of those in attendance.

GROUP DISCUSSIONS

Other groups were: Bridges and structures—where subjects were discussed covering new designs, reconditioning and strengthening bridges, etc.; materials group—covering surface treatments, guard rail designs, new methods in concrete highway construction with reference to minimum allowable cement content and maximum allowable water content.

Design of lower type pavements for light traffic roads and lower cost roads where economic conditions would probably have a large part in causing their construction were subjects that attracted considerable attention in the road design group. The road construction group discussed established methods and types of construction as well as types now being developed. In this discussion low cost bituminous pavement for light traffic received a great deal of attention as well as reconstruction and resurfacing of existing pavements, particularly in the municipalities. The highway research group discussed "Are we too reluctant to adopt new methods and practices?"

Roadside planning and development was discussed both within the group meeting under this head and on the floor of the general meeting through papers presented.

It was developed through the meeting that roadside beautification is a demand of the user of the highway as well as the satisfaction to the laudable pride that the engineer has in dressing up and presenting a highway as a masterpiece and a work of art.

Administrative problems were considered by a group and covered matters that might determine policies of

RESOLUTIONS ADOPTED BY NATIONAL HIGHWAY BODY

Following are some of the resolutions passed at the recent annual convention in Milwaukee of the American Association of State Highway officials:

RESOLVED, That this Association petitions and requests the Congress of these United States to make appropriations of regular Federal aid to the States in the amount of not less than \$125,000,000 per year for the two-year period beginning July 1, 1934, and in addition thereto for each year the usual relative grants for roads through national forests and public domain.

RESOLVED, That all the highway work undertaken with funds supplied from State sources or borrowed from the Federal government, for which State revenues are pledged as security, shall be undertaken under the supervision of the State highway departments and under the general procedure established for the administration of Section 204 of the National Industrial Recovery Act, in order to secure coordination of effort and result.

RESOLVED, That all gasoline tax revenues and all motor license and registration license fees are essentially State revenues and should be expended by the State or under the supervision of the State or in cooperation with the National government, upon some properly selected system of roads. Any other use of these funds may easily undermine a great national enterprise and is unsound governmental policy.

RESOLVED, That this Association strongly recommends to all the States that no support be officially given to any proposal to identify by an historic, local, personal, or other name, any highway whatsoever; and be it further

RESOLVED, That the standard signs, signals and markers as promulgated by this Association are hereby recommended to all the States for use in all public highways, to the exclusion of all other official signs, signals and markers.

WHEREAS, Important secondary roads or feeder roads are becoming more and more a State obligation: Be it

RESOLVED, That when a State Legislature adds this duty to a State, sufficient funds should be provided to take on the added obligation.

State highway departments as well as be the cause of legislative action by legislative bodies. The stimulated interest shown by political subdivisions of the states inspired by the provisions of the National Recovery Act and the allocation of funds to states for highway purposes caused wide discussion on future Federal and State policies dealing with the construction of feeder or local roads.

Some members of this important committee were of the opinion that Congress might attempt to dictate the type of construction on Federal aid

(Continued on page 25)

New Waterman Canyon Road Opened at Ceremony. Switchbacks Abolished

WITH impressive ceremonies in which State highway officials and representatives of civic bodies of San Bernardino participated, the last high gear unit of the Waterman Canyon gateway to the great recreational area of the San Bernardino Mountains lying along the Rim O' The World Drive to Lake Arrowhead and Big Bear Lake, was officially opened and dedicated at 2 p.m. on Saturday, October 22d.

A cavalcade of automobiles proceeded from the office of the San Bernardino Chamber of Commerce to the lower end of the new paved highway at the junction near the Indian Arch entrance to the Arrowhead Hotel-Hot Springs road, where the ribbon barrier was cut by Commissioner Frank A. Tetley of Riverside representing the California Highway Commission.

NOTABLES PARTICIPATE

The party then proceeded up the new highway to Panorama Point, a scenic spot overlooking the San Bernardino Valley, where the principal celebration was participated in by Morgan Keaton, Assistant Deputy Director of the Department of Public Works; District Engineer E. Q. Sullivan of the State Division of Highways; R. H. Mack, Secretary of the San Bernardino Chamber of Commerce; President Sanborn and Secretary Chas. Mann of the Rim O' The World League; Supervisors John Anderson, Jr., and Arthur L. Doran of San Bernardino County; Earnest East, Chief Engineer, Automobile Club of Southern California; Ray Stockwell, president of the San Bernardino Chamber of Commerce and others.

The completion of this lower Waterman Canyon project at a cost of \$350,000 eliminates the old road up the floor of the canyon with its steep grades, switchbacks and hair pin turns so sharp that large cars had to back up to negotiate some of them.

MORE GRADUAL ASCENT

The new 24-foot roadway follows a high line along the west wall of the canyon for four and a half miles to a junction with the completed improved upper portion of the highway. The new route makes a more gradual ascent with a maximum gradient of 6.4% and only 25 long radius curves compared with a

maximum 22% grade and 71 sharper curves on the old route.

In describing the new route and the general highway improvement program for making this mountain area more accessible to motorists, Commissioner Tetley said:

"As each unit of the highway approaching the San Bernardino mountains has been completed, the number of automobiles entering has continually increased. The number of mountain homes now runs up into the population of a large city. Most significant of all is the establishment of the great number of boys and girls summer camps. Y. M. C. A., Y. W. C. A., Boy Scouts, Girl Scouts, County and City playgrounds, church camps, in addition to the thousands of private camps are springing up in the spacious forests.

SNOW SPORTS ENCOURAGED

"One of the mountain possibilities that is just beginning to be capitalized is the winter sports. The California Highway Commission has a definite policy of keeping the major roads clear of snow to encourage this activity. Equipment is constantly being improved and as the years go by it becomes easier to efficiently remove snow.

"Forty minutes from the orange groves of the valleys to toboggans in the snow is the unique position of Southern California. With the taking into the State system of the three new desert roads to the mountains the State Highway Commission will, by the improvement and development of these roads, assure safe transportation for the great crowds that go into the mountains from the desert and from the mountains to the desert in the winter time.

"There is probably no parallel experience in the world compared with driving from the sparkling snow of the San Bernardino mountains to the warm sunny desert covered with flowers in less than an hour. As the years go by and these new roads are developed, this feature of the San Bernardino mountains will become famous throughout all California and throughout the world.

"Three such routings are described in the new highway Legislative Act as being taken over. One will proceed down into the east

(Continued on page 27)



BREAKING A BARRIER of silken ribbon, Frank A. Tetley of Riverside, member of the California Highway Commission, opened the new Waterman Canyon road approach to the Rim o' the World recreational area of the San Bernardino Mountains. The ceremonial party in the bottom picture includes (left to right): A. J. Brown, editor; Supervisor A. L. Doran; President Ray Stockwell, San Bernardino Chamber of Commerce; E. Q. Sullivan, State District Engineer; Supervisor John Anderson; Royal Mack, secretary Chamber of Commerce, and Commissioner Tetley. The top picture shows the new highway, beginning a gradual ascent of the west wall of the canyon, while the old road at right proceeds up the canyon floor by steep grades and switchbacks. Left center is pictured a section of the new highway, while at right are seen some of the old switchbacks.

100 Million Dollars for Workingmen

(Continued from page 1)

Upon the filing of this referendum petition I had the alternative of permitting this act to remain ineffective until after the general election in 1934, or of calling a special election. To have delayed would have meant a postponement of relief from a water shortage now acute and serious, a failure on my part to aid a project providing for unemployment relief of the first magnitude, and, finally, loss of all opportunity to receive a gift of more than \$43,000,000 under the N. R. A. and Federal financing for the balance of the cost, in all a total of \$170,000,000, three-fourths of which will go into the pockets of labor, mostly in California. Just think of over 100 million dollars to the working man of California if you vote "Yes" for the State water project and it costs you nothing.

Therefore, on October 4, 1933, I issued the proclamation calling the special election for December 19, 1933, so that you voters may have opportunity, before it is too late, to determine whether this project shall be authorized in time to receive this great gift of Federal money in aid thereof and the financing of the balance of the cost by Federal funds—a self-liquidating project. Never again may we hope to have such an opportunity of Federal aid on a project that affects the prosperity of every human being in California.

It is a project which will create no State liability, obligation or debt. If built, it can only be built upon a "pay-for-itself" basis out of revenues from the sale of water and power made available by it, and all bonds issued will be revenue bonds

secured only by such revenues and not by State credit. I want to impress upon you most forcefully, that under no circumstances, can taxpayers, other than those within public agencies which voluntarily contract to pay for water or power, be compelled to pay a dollar of the cost of this great state-wide benefit or of any part of it. It will solve our most urgent, major water problems for a long time to come, will give immediate employment to thousands of our unemployed, and a livelihood for years to still more thousands of our people.

Prior to calling this special election and under date of September 27, 1933, I filed an application for approval of this project by the Federal Emergency Administration of Public Works. This application consists of 125 pages, includes maps, data and tables, and is accompanied by numerous exhibits. No effort will be spared in the prosecution of this application before the Federal authorities but hope of success in the final analysis now rests with you, the people of California. Your Legislature, your Governor and your constituted agencies of government have done their part, the plan is presented, the project is ready for construction, your favorable vote on December 19, 1933, is necessary.

Without your approval the public weal will suffer and California will lose a gift of over \$43,000,000.

Let us now turn to a more detailed consideration of this project, its more important aspects and the act under which it is to be construed and financed.

DESCRIPTION OF CENTRAL VALLEY PROJECT

The units of this great development are:

(1) **KENNETT DAM** consisting of a 420-foot dam, a 3,000,000 acre-feet reservoir, and hydro-electric power plants at Kennett, a secondary dam and power plant at Keswick, all in the Sacramento River Canyon a few miles above Redding, and a power transmission line from Kennett to a central distribution point near Antioch in the Sacramento River delta;

(2) **CONTRA COSTA CONDUIT** consisting of a canal and pumping plants to convey fresh water from Knightsen in the Sacramento-San Joaquin delta southerly to Suisun Bay to the vicinity of Martinez;

(3) **SAN JOAQUIN PUMPING SYSTEM** consisting of dams, locks, channel improvements, conduits, and pumping plants to convey not less than 3000 cubic feet per second of delta waters up the San Joaquin Valley to the mouth of Fresno Slough;

(4) **FRIANT DAM** consisting of a 252-foot dam, a 400,000-acre-feet reservoir, and power plant on the San Joaquin River in the foothills east of Fresno;

(5) **MADERA CANAL** leading northerly from Friant Dam to the Chowchilla River in Madera County;

(6) **FRIANT-KERN CANAL** leading southerly from Friant Dam and passing through the counties of Fresno, Tulare and Kern to the vicinity of Bakersfield.

A project with three and one-half million acre-feet of water storage capacity, and three hundred fifty-five thousand kilovolt amperes of electric power capacity is provided.

To the Sacramento Valley this development means the storage of storm waters which now flow down the Sacramento River in floods occasioning damage and constant expense to provide for their control and which then waste into the ocean. Withheld behind the great dam at Kennett, a major step in the solution of the Sacramento flood control problem will have been accomplished.

Withheld behind Kennett Dam at a season of the year when they occasion but a menace in the river below, these flood waters will be released into the river throughout the period of low summer flow, maintaining a constant stream at all times of not less than 5000 cubic feet per second, and assuring the navigability of the river to a depth of six feet to Chico Landing and a depth of four feet to Red Bluff. Thus will be solved the major problem of navigation upon this great artery of commerce.

Protection for \$50,000,000 Annual Crop

(Continued from preceding page)

Withheld and so released, this vast quantity of water will maintain Sacramento River levels throughout the year at heights many feet above present low flow levels and enable the numerous pumpers from this river to acquire their supplies at an annual saving of thousands of dollars.

Adequate supplies to meet irrigation and all other requirements throughout any and all years are thus guaranteed to Sacramento River irrigators and water users.

Relief from the annually recurring danger that the Federal government may exercise its paramount authority in aid of navigation and thereby arrest upriver diversions during periods of low flow, so as to protect navigation, will thus be afforded to Sacramento River diverters, as will also relief from the menace of a gigantic legal battle in our courts between Delta users and upper appropriators on the river, many hundreds of whom are now named as defendants in a pending suit by Delta landowners seeking to compel releases of summer flow sufficient to protect their lands from salt water penetration. To both sides this litigation would mean a cost of millions, would make no additional water available, and would finally result in the loss of thousands of acres of developments and millions in investments.

To the 400,000 acres of rich, fertile and productive lands of the Sacramento-San Joaquin River Delta producing an annual crop yield of \$30,000,000, waters supplied from this Sacramento River storage will maintain in Delta channels, reservoirs of fresh water at all times. Thus will be averted the permanent destruction of this great area by salt water penetration from San Francisco and Suisun bays and also the burden of the litigation instituted and now pending by delta landowners against Sacramento Valley diverters.

To the great industrial area in and about the upper San Francisco Bay region, with an annual value of production in excess of one hundred million dollars, a fresh water supply from Kennett storage, through the Contra Costa Conduit, will reduce present water supply costs by thousands of dollars annually and will encourage establishment of additional industries now deterred by the absence of an economically and assured supply.

ADDS NAVIGABLE MILEAGE

To the San Joaquin Valley, the pumping system proposed will provide for the navigability of its great river to Hills Ferry 86 miles upstream from Stockton, will carry water for irrigation needs 63 miles further south to Mendota, and will enable an exchange for present supplies which may then be stored in Friant Reservoir for exportation northerly and southerly to areas, now desperately in need of water, which will be served by the Madera and Friant-Kern canals. Also surplus flood waters now unused will be stored in Friant Reservoir and rights to water, now supplied to "grass lands" within the valley, will be purchased so that a higher use of such water may be made by means of its storage in Friant Reservoir.

Thus will be rescued from drought, highly productive areas of 400,000 acres which now have one-half enough water for their use and which have long been overdrawn from their underground supplies, causing lowering water levels and higher costs of pumping with final exhaustion of supply inevitable. To save 200,000 acres of these lands from reversion to desert conditions, lands that represent an investment of \$50,000,000 and a yield of \$20,000,000 in annual crop value, is a purpose of this project.

WIDESPREAD ECONOMIC VALUE OF PROJECT

So closely related to the direct benefits enumerated above as to be almost inseparable in any discussion of them are the economic considerations involved. To California this project has an economic value that far transcends its cost. It means:

(1) The restoration of navigation on the Sacramento to Red Bluff and its maintenance throughout the year unimpaired by seasonal shortages.

(2) The removal of all threat and danger of the curtailment of irrigation supplies from the Sacramento by the United States War Department in its exercise of paramount Federal authority in aid of navigation.

(3) The elimination of a cloud upon the title of upper Sacramento River users and the menace of a ruinous expense to both Delta users and upper users now occasioned by impending litigation.

(4) Adequate irrigation and other water supplies throughout the year to Sacramento River users.

(5) The maintenance of higher river levels and reduced pumping costs to Sacramento River users.

(6) A major accomplishment in the solution of the Sacramento Valley flood control problem.

(7) A fresh water supply at an annual saving of thousands to upper San Francisco Bay area industries producing annual values of \$12,000,000 and having an annual pay roll of \$13,000,000.

(8) The encouragement of further industrial developments in the Upper San Francisco Bay area.

(9) The protection from salt water ruination of 400,000 acres of Delta lands with an annual crop value of \$30,000,000 which area suffered a crop loss estimated at \$1,300,000 occasioned by salt water incursion during the dry year of 1931. Average yearly crop losses are estimated at \$500,000 and ultimate ruin of the soil itself is inevitable unless a remedy be provided.

(10) The rescue from return to the desert of 200,000 acres of Southern San Joaquin Valley lands

(Continued on page 20)

Novel Caisson Methods Used to Build Bay Bridge Substructure Described

Progress of substructure construction for the San Francisco-Oakland Bay Bridge has excited the keenest interest in communities of the bay area, particularly among the ferry-boat commuters, who view operations of the compressed air flotation caisson method of building the deep water piers. This new method was recently described to the student body of the University of California in a lecture by Chief Engineer C. H. Purcell, from which excerpts are given in the following article.

By C. H. PURCELL, Chief Engineer, San Francisco-Oakland Bay Bridge

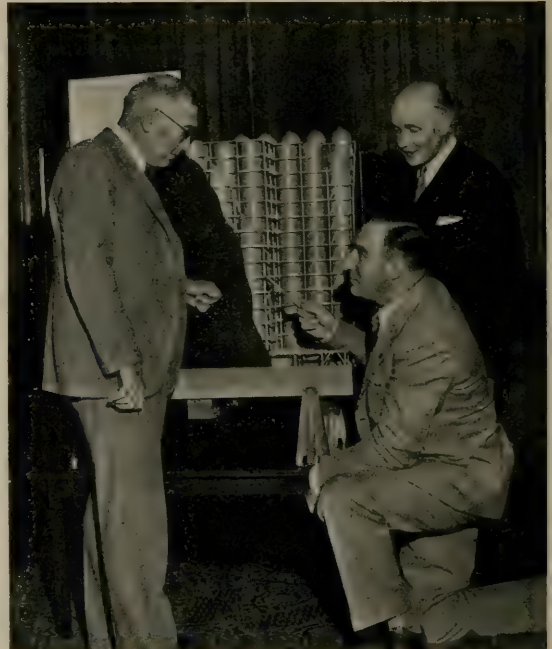
THE SAN FRANCISCO-OAKLAND Bay Bridge is distinctive as a large public project in that it is being built without taxation. This bridge is financed by means of the expectancy from its revenues and tolls, the Reconstruction Finance Corporation having underwritten the bond issue of the bridge.

The mortgage bonds by which this bridge is financed are liens against revenues only and both the Reconstruction Finance Corporation and the State of California Gas Tax Fund look to repayment out of the revenues of the bridge. Both the Reconstruction Finance Corporation and the State must be paid back in full for such bridge bonds as purchased before the bridge can become free to the traveling public.

USING NOVEL METHOD

The substructure of the San Francisco-Oakland Bay Bridge presents many different types of engineering, the most outstanding of which is the caisson floated by means of compressed air contained within cylindrical dredging wells. All our deep water bridge piers between Yerba Buena Island and San Francisco will be constructed by means of the compressed air flotation caisson method, which was perfected by one of our consulting engineers, Daniel Moran. This substructure method is different from that used on any similar project and is just as novel to engineers as it is to the layman.

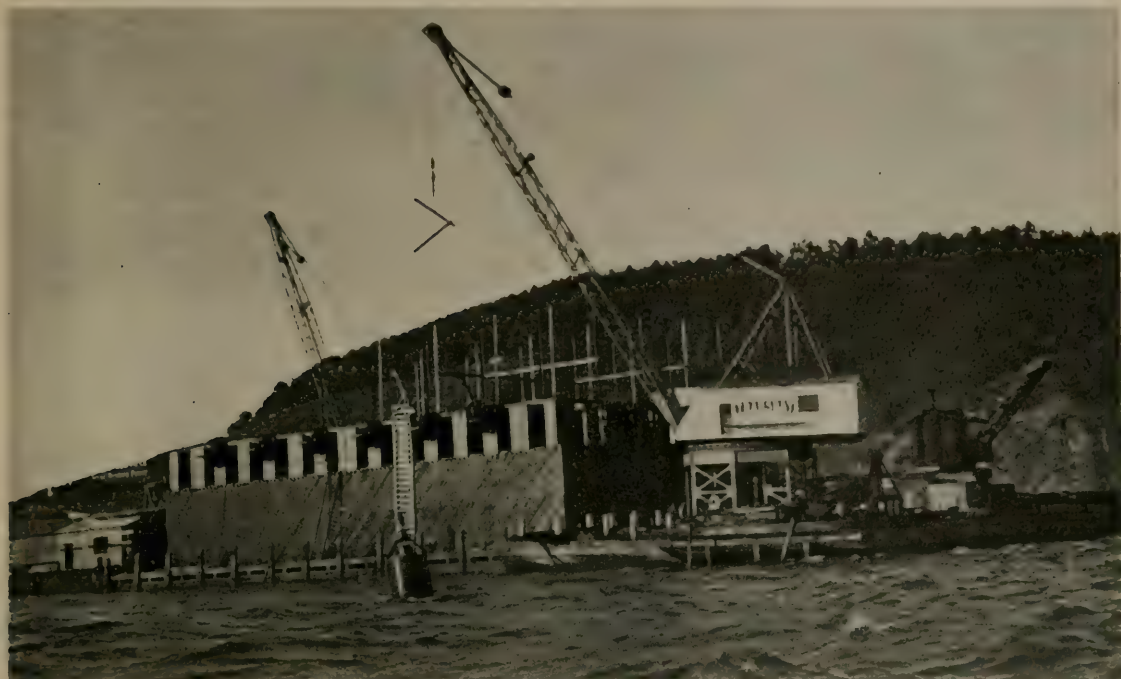
The caisson, already sunk 52 feet below water line, at Pier 6. 1110 feet west of Yerba Buena Island, is typical but it is not the largest of this type of foundation on this bridge. This caisson now under construction consists of a huge rectangular structure the size of a small apartment house, the first story of which is of steel and is known as the cutting



LATEST THING in caissons is represented in this compressed air flotation type model for the Bay Bridge being examined by Chief Engineer Purcell (left), Director Earl Lee Kelly (kneeling) and Leland W. Cutler.

edge. The walls above this cutting edge are of timber caulked with oakum and made watertight.

This Pier 6 caisson is 74' 6" wide by 127' long and the steel cutting edge is 13½' high. Within the timber walls of the caisson are set four rows of seven cylinders each. These cylinders by means of adaptor sections are widened out to a 15-foot square cell at the steel cutting edge; thus each cylinder for its first 13½ feet is a square 15 x 15-foot cell. It is then tapered up to a cylinder 15 feet in dia-



NOT AN APARTMENT HOUSE under construction but a compressed air flotation caisson for a Bay Bridge pier is pictured in the above photograph of a busy scene in the bay just west of Yerba Buena Island. The huge box is 74 feet 6 inches wide, 127 feet long and contains 28 steel cylinders each 15 feet in diameter. It is being sunk to bedrock 170 feet below the bay surface.

meter, which cylinder extends out the full height of the caisson.

CYLINDERS BUILT UP

When the caisson is located on site, concrete is poured around the cylinders. The walls are then built up in 20-foot lifts. Domes are cut off the cylinders and 20-foot lifts added to their height. After the 20-foot lift is completed, concrete is poured within the walls around the cylinders until it is necessary to add another lift.

By the alternate process of pouring the concrete within the walls and raising their height, the caisson is built up until its bottom rests upon the mud in the bottom of the bay. Pier 6 finds bottom at 105 feet below the surface of the water.

Once the caisson rests on the bottom, the domes are taken off the cylinders and dredging operations by means of two-yard clam-shell buckets are started to dredge out the mud from beneath the caisson up through the cylinders. The alternate cutting off the dome of the cylinder and adding more height is done by welding and cutting. Each time the dome is welded onto the cylinder, then cut off to be rewelded on again.

CAISSON BONDED TO ROCK

When the caisson lands on rock, concrete is poured into the twenty-eight dredging wells (the number in Pier 6) so that the caisson is bonded to rock. Approximately 30 feet of concrete will be poured within each cylinder. This pour takes place in the water, no effort being made to pump the water out of the caisson cylinders.

In the case of Pier 6, the caisson will find bottom at approximately 170 feet below the surface of the water. This concrete substructure will be built to 40 feet above the surface of the water and the steel tower erected thereon. * * *

Another substructure method on the San Francisco-Oakland Bay Bridge now in operation is that of the false bottom flotation caisson. Two piers are now being built by this method—1500 and 1000 feet west of the Key Route Mole, respectively.

FALSE BOTTOM TYPE

I will take Pier E-5 as typical. This caisson 60 x 90 feet, with the steel cutting edge built up approximately 13 feet high, contains three rows of five square cells. These cells are not fitted with cylinders as in the compressed air flotation caisson but the bottoms of each cell

Ridge Alternate Has No Sharp Curves

(Continued from page 2)

and the second consideration was that the greatest economy be effected which would be consistent with these standards.

The heaviest construction was on the section through Piru Gorge. It was evident from the first that a small mountain would have to be cut through if high standards of alignment were to be maintained. Since inferior alignment would not be tolerated, the "Big Cut" was made—230,000 cubic yards of rock were excavated in 400 feet of length, leaving a huge pyramid on one side. The ribbon of concrete over which traffic speeds swings on a gradual curve across one Piru Creek

of an essential highway route—a route to connect southern California with central and northern California. The degree of perfection of a highway on this route was necessarily from the first an economical balance between the cost of and amount of money available for such a highway and the amount of expenditure which would be justified by the volume of traffic to be carried.

Although the first cost of a highway routed through Tehachapi and Mojave would have been less than one constructed on the Ridge Route, the former routing would have been 50 miles longer and with the volume of traffic increasing rapidly the saving to traffic by using the Ridge Route easily justified the additional construction cost.

As traffic further increased in volume and speed the sharpest curves of the Ridge Route were "daylighted" but by 1929 it became apparent that any further major improvement on this highway would not be justified in proportion to the resulting savings to traffic. By this time traffic had increased to such proportions that it was evident any material saving in distance or improvement in alignment or grade would have a very great monetary value in reducing operating costs of cars over the route.

SURVEYS PROVED FEASIBILITY

Reconnaissance surveys indicated that it would be entirely feasible to build a new highway on much shorter and greatly improved alignment and at a much lower average elevation.

Although the first cost of such a routing would greatly exceed that of the original Ridge Route, economic studies indicated that the savings in traffic would be so great as to pay for its cost in 2½ years.

This new highway, known as the Ridge Route Alternate, was obviously the next logical step in the development of the major route between Los Angeles and Bakersfield. It should provide for the needs of traffic for a great many years to come, but when traffic finally increases to a point where this road is inadequate, which will eventually follow, the next succeeding step will be well defined. It will simply be a matter of widening the present new highway as the need arises with no loss in the present investment.

In order to help visualize the advantages of the new route over the old Ridge Route, the following comparison of the standards of the two routes is given.



HISTORIC MOMENT when Harry A. Hopkins (center), chairman of the California Highway Commission, representing Governor, cut the ribbon officially opening the Ridge Alternate. Left, Commissioner Tetley; right, Commissioner Stanton.

bridge, through this enormous cut, and across a bridge at the other end of the cut on beautiful alignment which does not slow traffic in the least. In traveling this highway the motorist need not fear that he will encounter a sharp curve at an unexpected place—there aren't any.

JUSTIFIED BY TRAFFIC

The Ridge Route Alternate was not conceived in a day, but has been the result of a logical evolution



OFFICIAL GROUP at Ridge Alternate ceremonies: (left to right) Secretary Howe, Highway Commission; Asst. State Highway Engineer McCoy; Acting Dist. Engineer Gillis; Dist. Engineer Cortelyou; Asst. Resident Engineer Telford; Chief Engineer East Auto Club of So. Calif.; Supervisors Mitchell, Orange and Brite of Kern; Asst. Dep. Director Public Works Keaton; Contractor N. F. Jahn; Secretary Nourse, Kern Chamber of Commerce; Resident Engineer Templeton; Assemblyman Rogers, Los Angeles; Wm. Shoemaker, Orange; Col. A. Marks, Taft; Chairman Hopkins; C. C. Carlton, State Rights of Way Chief; Acting Dist. Const'n Engineer George; Highway Commissioner Stanton; Nat Neff, Orange County Engineer; President Loudon, Economic Council, So. Calif.; Secretary Brashear, L. A. Chamber of Commerce; Carl Mock, Santa Ana Chamber; City Manager Nighbert, Bakersfield; Editor McCracken, Anaheim; Supervisor Wimmer, Kern County; President Simpson, L. A. Chamber of Commerce; Supervisor Quinn, Los Angeles County.

Items	Unit	Old Ridge Route	New Ridge Route Alternate
Length	Miles	36.45	26.85
Total curvature	Degrees	35,141	2,492
Highest elevation	Feet	4,234	3,550
Minimum radius of curves	Feet	70	1,000
Maximum grade	Per cent	6	6
		(Uncompensated)	(Compensated for curvature)
Total rise	Feet	4,630	3,450
Adverse grade	Feet	2,220	1,040
Roadbed width	Feet	21-24	38
		(Original contract)	
Width of pavement	Feet	20	30
Original cost		\$1,614,000	\$2,864,000

VAST SAVINGS PREDICTED

Interpreting these figures in terms of savings to traffic over the next ten years (based on traffic census which have been taken for a number of years past) the annual saving is estimated to be \$1,369,000 which capitalized at 5 per cent equals \$27,380,000 or roughly 9½ times the cost of the project. Where could a better investment of public funds be found than this?

The total construction cost of the Ridge Route Alternate is approximately \$2,864,000. This figure

will probably be changed slightly when the two latest contracts on the project, one for slide removal and one for shoulder oiling, have been completed. Including the contract for slide removal the total excavation amounts to 4,252,000 cubic yards. To place this vast amount of excavated material in its final location in the highway embankments 30,267,000 station yards of overhaul have been required or 77 times the total overhaul involved in the construction of the original Ridge Route. Ninety-seven thousand six hundred forty-eight cubic yards of concrete pavement and 16,722 cubic yards of concrete structure and slope pavement have been placed. The total reinforcing steel used on the project was 3,389,000 pounds.

RELIEVED UNEMPLOYMENT

Construction of this highway has come at an opportune time, when the employment which it has afforded has meant much. An average of about 150 men have been employed directly for the past 3½ years in its construction. In addition to this, much additional employment has been afforded in the cement plants and steel mills by the 686,220 sacks of cement and the 3,389,000 pounds of steel which were used in construction.

The question has been asked many times why the old Ridge Route was located to follow the mountain combs over tortuous alignment rather than following the more direct and lower location of the Alternate Route. The main reason was that the cost of such

(Continued on page 28)

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

Official journal of the Division of Highways of the Department of Public Works, State of California; published for the information of the members of the department and the citizens of California.

Editors of newspapers and others are privileged to use matter contained herein. Cuts will be gladly loaned upon request.

EARL LEE KELLY-----Director
JOHN W. HOWE-----Editor

Address communications to California Highways and Public Works, P. O. Box 1103, Sacramento, California.

Vol. 11 OCT.-NOV., 1933 Nos. 10-11

Detour—Men at Work

With over \$216,000,000 in programmed State and Federal highway work, the Far West in the next 2 years will build the greatest and most comprehensive group of useful roads, bridges, and grade separations of any similar period.

Based on the Bureau of Public Roads estimate of about \$1,250 per man-year as the average labor earning necessary for decent living conditions, the total NRA allotment of \$3,300,000,000 means work for 2,640,000 men on actual construction for a year. The corresponding \$450,000,000 in Federal money for highways of the nation will keep 360,000 men in the field. Then in the Far West's 2-year highway program aggregating \$216,000,000, there are some 62,000,000 man-days of work. Behind the construction lines in the transportation, manufacturing, and other industries, stand $1\frac{1}{2}$ to 2 men for every direct worker in the field.

One central steering organization—the U. S. Bureau of Public Roads—from its 17-year background of service and intensive study of highway transportation problems supervises the majority of the State and Federal road programs, correlating them to speed the return of men to work.

"Detour—Men at Work" becomes a familiar warning sign on highways throughout the country. As such this sign takes fresh significance. Now it may be praised as a symbol of the upward climb to better times, rather than damned for minor inconveniences caused the motorists.—*Western Construction News.*

With the exception of Michigan, California has a larger registration of motor vehicle trailers than New York or any other State, which may be an indication either that Californians are champion motor tourists, or that more trailers are used on commercial vehicles than in other areas.

\$955,446,000 Spent on State Highways of Nation in 1932

STATE highway expenditures in 1932 amounted to \$955,446,000, according to information collected from State authorities by the Bureau of Public Roads, U. S. Department of Agriculture. Of this amount, \$816,765,000 was expended for construction and maintenance of highways, interest on bonds and notes and miscellaneous expenses. These items represent the capital investment and current expenses on account of State highways. Other disbursements, such as principal payments on bonds, transfers to local road authorities and obligations imposed by statute totaled \$138,681,000.

Maintenance of the State systems, which include 358,210 miles of main highways, gave employment to from 130,000 to 160,000 men throughout the year. States surfaced 29,500 miles of road and more than 6000 miles were graded. The direct employment furnished by this construction was 86,000 men in January. This rose to 215,000 in September and was 144,000 in December. For every man directly employed it is estimated that two others were indirectly employed in supplying and transporting materials and machinery.

Total funds available were \$1,173,576,000, consisting of \$275,259,000 balance from previous year, \$632,200,000 current revenue from State sources, \$161,467,000 federal and local contributions, and \$104,650,000 from sale of bonds and notes. More than 90 per cent of the current State revenue was derived from motor vehicle fees and gasoline taxes.

TOPOGRAPHIC SHEET ISSUED OF EL MIRAGE QUADRANGLE

The final topographic sheet of the El Mirage Quadrangle recently made its appearance. This work was done in cooperation between the County of Los Angeles and the U. S. Geological Survey. The sheet is published on a scale of 1:24,000. Copies are available either at the local stationers or through the Superintendent of Documents, Washington, D. C.

RED LANTERNS FOR PEDESTRIANS

Pedestrians in Kansas may soon have to carry red lanterns when they walk on the highways after dark. Legislation providing that all walkers display red lights is being considered in the Sunflower State as a remedy for the large number of highway accidents involving pedestrians, says a bulletin of the Minnesota Safety Council.

Viaduct Cost Cut by Economies

(Continued from page 5)

48-inch storm sewer that must also remain intact. Numerous oil, gas and water lines below ground remain to hinder the contractor's foundation operations until removed.

TRACKS RELOCATED

It will be necessary for the Santa Fe Railway to shift several of their yard tracks slightly to meet the standard side clearance of 8 feet 6 inches as required by the Railroad Commission. Track No. 46 mentioned above had to be relocated several feet north and depressed one foot below its original elevation to secure standard clearance above top of rail. Original plans called for the building of a temporary steam line to serve the Santa Fe yards while their main 6-inch steam line was being removed from the old viaduct and rebuilt into the new structure.

Investigation into this matter revealed possibilities of a saving amounting to several thousand dollars by transferring this 6-inch line directly from the east half of the old viaduct from which it is suspended to the west half of the new structure which, by coincidence, lays sufficiently close to and slightly above the original structure to permit steel erection without materially disturbing the old viaduct. The line may thus be swung from one to the other without interference of operations save for two new connections required during which time a locomotive will supply necessary steam for the Santa Fe Harvey House at the depot, which relies entirely upon this line for cooking facilities.

ECONOMIES EFFECTED

Inasmuch as all railroad changes due to construction of this new viaduct come under the item "Total Cost of Project," it was to the State's interest to effect as many economies of this type as possible.

Further savings will result from salvaging practically all of the original steel girders out of the old viaduct, refabricating and reinforcing them to suit, and erecting in the new structure. A variety of span lengths was necessary to accomplish this and provide proper side clearance to yard tracks at the same time, but with a little manipulation a group of spans can be obtained in which old girders will be utilized in all but those

requiring special shallow deck construction to secure necessary overhead clearance above railroad tracks.

Two stairways are provided, one built of concrete at Third Street leading up onto the structure from the street below and a light steel stairway near the oil supply house leading into the railroad yard.

RAILROAD COOPERATING

Expansion and contraction of the structure due to temperature, which amounts to a total of 8 inches under a temperature range of 120 degrees, is taken up at one point only. To provide for this large amount of movement, a double steel bent will be installed near the middle of the bridge with a series of interlocking steel bars in the roadway slab, with each span on either side of this bent securely tied back into the tower bracing in spans 5 and 21.

Construction of this viaduct in a minimum period of time and at the lowest reasonable cost has been made possible largely through the willing cooperation of the Santa Fe Railway Company. During actual construction of the piers and the erection of steel in the floor system they have indicated their willingness to close off several of their yard tracks, thereby hampering their own train operations, to permit this work to be done with the least delay, and in all other respects have promised the contractor the utmost in helpful coordination.

M. E. Whitney of the Bridge Department is resident engineer, and will have charge of construction.

TWENTY-SEVEN STATES NOW PUTTING THEIR FULL NAMES ON LICENSE PLATES

The practice of spelling out the full name of the State on automobile license plates, instead of an abbreviation, is growing in popularity. California and 26 other States and the District of Columbia have now abandoned the shorter form, with the result that wherever motorists of those States travel the name is readily noted. Five States having State symbols on their 1933 license plates are: Louisiana, Montana, Texas, Pennsylvania, and South Carolina.

"So you assembled your car entirely from second-hand parts? What did it cost you?"

"Not a cent—I live near a railway crossing."

Water Plan "Pay-for-itself" Project

(Continued from page 13)

valued at \$50,000,000 and producing annual crop values of \$20,000,000.

(11) The establishment of navigability upon the San Joaquin River for a distance of 86 miles upstream from Stockton.

(12) The maintenance of business profits to the Los Angeles metropolitan area from its great tributary domain in the South San Joaquin Valley is of paramount importance to all Southern California. The State has just completed the Ridge Route Alternate at great expense to aid the flow of commerce and commodities to and from this vast hinterland source of supply of the Los Angeles metropolitan area. A fertile, flourishing San Joaquin Valley means an increase of buying and selling steadily adding millions of dollars to the business of Los Angeles and its seaport.

The maintenance of like profits to the San Francisco metropolitan area from other parts of the Central Valley is of no less importance to said area.

Impossible to estimate but nevertheless far-reaching and of great consequence in regard to our economic well is the support that great industrial and agricultural enterprises yield to an army of professional and

business men engaged within their immediate vicinity and even throughout the State. To stand by and allow these investments of many of our people to perish and great pay rolls to diminish, and populations largely dependent for support upon such enterprises to suffer, is but to court disaster and insure greater economic distress especially when the very process of affording protection and relief will give employment to thousands of our fellow citizens, a livelihood to many thousands more for years to come and put into circulation \$170,000,000.

May any Californian turn a deaf ear to such an opportunity to provide for present relief and future security? Can any Californian whether he live in the mountains of Del Norte County or on the banks of the Colorado say that he, or his, will not be benefited? Or even if he thinks there is no benefit to himself, what reason should deter the help which he may so easily extend at the ballot box and without incurring one cent of cost or obligation on account of this project which must pay for itself and is a charge against its revenues and its revenues only.

FINANCIAL SET-UP OF THE PROJECT

It is a startling statement but it is nevertheless a true statement that this vast \$170,000,000 undertaking is to be financed and paid for without the cost of one cent to the California tax payer and without incurring one cent of obligation to the State of California.

It positively does not and can not create a State indebtedness nor does it create any moral obligation on the part of the State to at any future time assume indebtedness on account thereof.

It is a project to be financed by the sale of revenue bonds—the same character of bonds under which the \$75,000,000 San Francisco-Oakland Bay Bridge is now being financed and built. This plan has also been employed in financing the great George Washington Bridge over the Hudson River by the Port of New York Authority. The bond provisions of the Central Valley Project Act are taken almost verbatim from those of the California Toll Bridge Authority Act of 1929, twice upheld by the Supreme Court of California. In the decision in one of these cases rendered April 20, 1933, Chief Justice Waste speaking for the court, declares:

"We must not lose sight of the fact that these bonds are not, and can not be, bonds of the State creating a general liability against it. So far as payment of principal and interest of the bonds is concerned, no funds of the State, general or special, can be resorted to."

Under this plan of financing the bonds issued and sold are secured only by the revenues obtained from the sale of water and power made available by

the project and to this same effect an opinion was recently given by Attorney General Webb.

It is truly a "pay-for-itself" project. The purchaser of one of these bonds has no other security than the revenues to be so obtained; the State gives no guarantee of repayment; the Project Authority consisting of the Attorney General, State Controller, State Treasurer, Director of Finance and Director of Public Works must first be convinced that revenues will be sufficient to finance the project; no bonds may be issued until in their judgment they are convinced; and in turn it is obvious that the evidence, commitments and contracts upon which they base such assurances of revenue must convince the buyer, be it the Federal Government or other agency or an individual. The act itself is positive and certain in its provision in regard to these matters.

The money to build the project will be obtained from revenue bond purchasers and these purchasers will be repaid by revenues obtained from those who receive the benefits of the water and power made available. This is the plan in its essence, it is not and can not under the act be otherwise.

No one is compelled to buy bonds, no one is compelled to purchase water and power. If the project proceeds it will be dependent upon all investors willing to advance money on that basis and upon purchasers of water and power willing to pay the price fixed in return for profits and benefits to be secured by them.

Closely related to the above plan of financing, is the authority of the United States under the N. R. A. to contribute from the \$3,300,000,000 public works administration fund 30 per cent of the cost of labor

N. R. A. Gift of \$43,606,000 Available

(Continued from preceding page)

and materials of any project adopted under that act for Federal assistance, and to also purchase all bonds issued to raise the balance of the money required to build a project.

Already approved by the Chief of Engineers of the United States War Department, the United States Bureau of Reclamation, and the United States Senate Committee on Irrigation and Reclamation, it is well within the bounds of probability that this project will be adopted for N. R. A. financing.

It is a project ideal in its adaptation to President Roosevelt's unemployment relief program and of great value to the Federal Government in meeting its long established policy of aiding in navigation and reclamation work in the several states through its War and Interior Departments. A favorable vote by the people therefore makes possible, indeed probable, a Federal gift in aid of this project in the sum of approximately \$43,606,000 and the purchase by the United States of all bonds issued to raise the balance of the money required.

SOME IMPORTANT PROVISIONS OF THE CENTRAL VALLEY PROJECT ACT

Unhesitatingly, I assure you, my fellow Californians, that the act under which this project is to be constructed safeguards and protects your vested rights and your pocketbook from exploitation. A vigorous campaign is being waged in an effort to dissuade you from a course which if taken can mean but the promotion of your own welfare immediately and for all future time. Briefly, I submit to you some of these safeguards and provisions of this act in support thereof:

(1) No State indebtedness is created:

"Sec. 19. Any and all bonds so authorized * * * shall constitute obligations only of said authority * * * and shall contain a recital on the face thereof * * * that neither the payment of the principal or any part thereof or any interest thereon constitutes a debt, liability or obligation of the State of California. Bonds issued under the provisions of this act shall not constitute or be a debt, liability or obligation of the State * * *."

(2) The only bonds authorized are secured by revenues only:

"Sec. 19. Any and all bonds so authorized shall * * * contain a recital on the face thereof that the payment or redemption of said bonds and the payment of interest thereon is secured by a first and direct charge and lien upon the revenues of any nature whatever received from the operation of said Central Valley Project * * * Bonds issued under the provisions of this act * * * shall be secured only by the rates, charges, and revenues established or accruing from the use or operation of the said Central Valley Project Act * * *."

(3) These revenue bonds are bonds of the Project Authority and not obligations of the State of California.

"Sec. 19. Any and all such bonds so authorized shall be issued in the name of the Authority and shall constitute obligations only of said authority and shall be identified as Water Project Authority revenue bonds * * *."

(4) Self governing public agencies defined in Section 2 of the act and designated as "State agencies" for the purposes of this act are authorized to cooperate

by advances or contributions of money or property. Such authority is of course permissive only and subject to the will of the people either directly or as expressed through their elected officials and as established by the statutes or charters of such agencies. The State, as such, or its departments and other executive branches of government are also permitted to cooperate by advance or contribution but no power to do so without separate and specific legislative authorization is conferred.

Although the provisions of Section 16 of the act provide only for such legitimate cooperation in aid of the project they are nevertheless being misconstrued and declared to be in support of assertions that all or any State funds may be arbitrarily turned over to the construction of this project. Section 16 specifically provides that "appropriations therefor may be made from any funds available for such purpose."

Funds must be appropriated by the Legislature in order to be available to executive branches of our State government and must be "for such purpose" which means that this permission to so cooperate is and will remain inoperative unless funds have been or shall be appropriated by the Legislature either expressly for such advance or contribution or for purposes so coincident with the purposes of the project that such an advance or contribution fairly constitutes but another means of applying such funds to the purpose for which the Legislature designated in making them available.

(5) No interference with vested rights and no taking of private property for the project is authorized except upon exercise of the power of eminent domain and upon compensation paid. The provisions of Section 12 very specifically so provide.

(6) The owners and inhabitants of watersheds from which transportation of water is made to other watersheds are protected in a first right to the waters of their area as and when needed therein as against any taking thereof by the Project Authority under this act. Thus the Sacramento Valley will not lose any right to waters taken and conveyed into the San Joaquin Valley. At any time the Sacramento Valley shall need any of such water it is guaranteed the right to take and use that water. Section 11 so provides:

(Continued on page 22)

A Livelihood to 100,000 for 3 Years

(Continued from page 21)

"Sec. 11. In the construction and operation by the authority of any project under the provisions of this act, no watershed or area wherein water originates, or any area immediately adjacent thereto which can conveniently be supplied with water therefrom, shall be deprived by the authority directly or indirectly of the prior right to all of said water reasonably required to adequately supply the beneficial needs of said watershed, area or any of the inhabitants or property owners therein * * *"

(7) The primary right of the people of California to the power developed by this project is protected by

provision for a transmission line to a central distribution point near Antioch (Subd. (1) of Sec. 4) and by permission to construct additional transmission and distribution facilities as necessary (Subd. (7) of Sec. 4); by the provisions of the last paragraph of Section 9 relative to transmission of electric energy to central points for supply to State agencies; by the first paragraph of Section 8 giving preference to State agencies in awarding contracts in case of equal and equivalent offers; and by the provisions of the third paragraph of Section 9 relative to cancellation upon five year's notice of contracts under which any person, firm or corporation other than a State agency acquires water or power for resale.

UNEMPLOYMENT RELIEF SHOWN BY CONSTRUCTION SCHEDULE

Lest any doubt the claim made that this project will give employment to 25,000 men and a livelihood for 100,000 people for the next three years and for a lesser number for many years to come, I call your attention to the following specifications:

(1) A construction schedule providing for employment ON THE PROJECT of

14,100 men in 1934
17,900 men in 1935
14,130 men in 1936
12,000 men during first 3 months of 1937
3,000 men during remainder of 1937
A maximum of 4370 and a minimum of 1000 during 1938.

(2) The employment of a GREAT ARMY OF MEN in the production, manufacture and transportation of materials and supplies REQUIRED for the project.

(3) Engineering estimates of labor and materials required are as follows:

6,528,000 cubic yards of concrete.
20,809,000 pounds of reinforcing steel
114,543,000 pounds of structural steel
6,496,000 barrels of cement
5,836,000 cubic yards of rock
3,302,000 cubic yards of sand
38,311,000 cubic yards of excavation
186,224,000 man-hours of labor

Secretary of the Interior Ickes, in charge of the President's Public Works Program, in speaking of the second army of workers who must produce the materials required for the first army engaged directly upon any great project, illustrates his point as follows:

"It takes 10,581 man-hours of labor for the construction of a mile of average roadway. But it takes more than 18,927 man-hours of labor to supply the materials used on this mile of road. Thus the indirect benefit to labor is almost twice the direct benefit to those who work on the actual construction job."

If Secretary Ickes is right the estimate of 25,000

men all told is *ultra-conservative* and we may expect during the three peak years of construction, a far greater total number will be given employment as a result of this huge enterprise.

Coincident with our great unemployment emergency, this project will produce three years of immediate employment during which the bulk of its work will be accomplished, but for many years to come it will afford work for large numbers of men and in its maintenance and operation will afford permanent employment to many men.

CONCLUSION


The Central Valley Project Act will be adopted or rejected by you, the people of California, on December 19, 1933. In your behalf and as your Governor I ask for approval of a project which will be a mighty factor in bringing to California prosperity now and security for the future.

I stand not alone. Organized labor, the State Chamber of Commerce, the State Grange, boards of supervisors, boards of city trustees, civic organizations and forward looking, progressive and public spirited leaders and citizens throughout the State have endorsed the project.

The campaign, your campaign, in this cause is being conducted by the State Water Plan Association, 610 Insurance Building, Sacramento, California, under the able leadership of State Senator Bradford S. Crittenden, Stockton, Chairman; State Senator J. M. Inman, Sacramento, Vice Chairman and Treasurer; P. D. Nowell, Tulare, Secretary; Judge Francis Carr, Redding; Jesse Poundstone, Grimes; George A. Atherton, Stockton; W. B. Hogan, Stockton; R. P. Easley, Antioch; Judge Matt I. Sullivan, San Francisco; A. B. Tarpey, Fresno; State Senator John B. McColl, Redding, and other associates.

Support this organization in its campaign to present the true facts that all progressive and public minded citizens may know the truth and vote for a project which entails no detriment to any man and benefit to every citizen of California.

(Continued on page 28)




WATER RESOURCES

*Official Report
As Of*

November 1, 1933

EDWARD HYATT, State Engineer



Taking advantage of the opportunity of securing funds from the Federal Public Works Administration some irrigation districts have applied for loans for new construction extensions and improvements. The Federal Government has allocated \$1,500,000 to the Sacramento flood control project and work is to commence immediately by the War Department on the permanent bank protection program for which the State contributes one-third of the cost.

The flow of the Sacramento River at Sacramento and of the San Joaquin near Vernalis has increased and a marked recession of salinity is indicated at Delta sampling stations.

Details of dam construction, water applications, permits and further activities of the Division of Water Resources are contained in the following monthly report of the State Engineer:

IRRIGATION DISTRICTS

Exclusive of funds requested for the construction of the All-American Canal, applications by irrigation districts amounting to \$1,250,000 have been filed with the Federal Administration of Public Works by irrigation districts for loans of funds for new construction or extensions and improvements.

At a recent special election called on petition of district landowners the question of the dissolution of the Foothill Irrigation District in Tulare County was submitted to a vote. The count was 292 votes for and 13 against dissolution, the proposition carrying with well over the two-thirds majority required by law. The proceedings are now awaiting the confirmation of the superior court.

The voters of the East Contra Costa Irrigation District approved a bond issue of \$76,000 at a special election October 7th. The proceeds from the bonds are to be used for the installation of natural gas engines in the pumping plants of the district.

At a meeting held at San Martin on October 6th the farmers in that part of Santa Clara County lying between Morgan Hill and Gilroy proposed the organization of a water district, the principal object being to increase the ground water supply of the area by diverting the flood waters of Uvas Creek into the channel of Llagas Creek.

With respect to requests for approval of modifications of their assessments for the 1933-1934 levy,

reports were made to the District Securities Commission on the economic and financial conditions in eleven irrigation districts.

FLOOD CONTROL AND RECLAMATION

Maintenance of Sacramento Flood Control Project.

During this period routine maintenance work has been performed on the flood control system with a small force. Partial repairs are now under way to the Hoke ranch bridge over the east borrow pit of the Sutter By-pass. This work involves the driving of 20 piles for construction of two end supports for the 95-foot truss span. After the completion of the abutments the span will be lowered 7 feet and placed thereon. This work is necessary to insure the safety of the bridge during flood season, after which the two approaches to the span will be constructed.

Emergency Flood Protection and Rectification of Rivers.

Two small jobs of emergency bank protection on the Mad River near Blue Lakes in Humboldt County were completed during this period, at a total cost of \$1,600.

Sacramento Flood Control Project—Construction.

The efforts made by the Reclamation Board and this office to have Citizens' Conservation Corps camps established for clearing flood channels during the winter months have not been successful, the allocation of these camps having been definitely disapproved.

Federal funds to the amount of \$1,500,000 have been allocated to the Sacramento flood control project for expenditure during the 85th fiscal year. The State of California through the Reclamation Board will cooperate in this work probably to the extent of \$500,000, the main items of work to be the construction of levees and the enlargement of the Sacramento River below Cache Slough.

Sacramento Flood Control Project—Bank Protection.

Immediate commencement is contemplated of the permanent bank protection program on the Sacramento flood control project. This is to be done by the War Department in cooperation with the State, the actual work to be performed by the War Department, which contributes two-thirds of the total cost and the State one-third. A total of \$150,000 will be expended for this purpose before July 1, 1934. Under this program, which is expected to be carried on continuously for a number of years, only bank protection of a permanent type is to be

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Salinity Recession Recorded in Delta

(Continued from page 23)

installed, so that eventually the river banks and channels will be permanently stabilized.

Russian River Jetty.

Work has continued on the jetty at the mouth of the Russian River at Jenner with a force of 12 men. A satisfactory quantity of rock of large size has been placed in the jetty during this period.

Pajaro River.

Contract has been entered into with L. C. Karstedt of Watsonville for clearing the channel of the Pajaro River. Work was commenced on October 16th, to cost \$4,000. This is being done in cooperation with Santa Cruz and Monterey counties.

Flood Measurements and Gages.

Routine preparation has been made for the operation of the system of automatic water stage recorders and the collection of data during the winter season. On account of lack of funds routine collection of flood stage data only will be attempted for this season, unless unusual flood stages occur which would make it desirable to meter the flood flows.

WATER RIGHTS

Supervision of Applications to Appropriate.

During the month of September 37 applications to appropriate water were received; 9 were denied and 20 were approved by the issuance of permits. In the same period 3 permits were revoked and the rights under 6 permits were confirmed by the issuance of license.

Inspection of projects reported complete were made during September in Sacramento, Amador, Placer, Sierra and Plumas counties.

ADJUDICATIONS

Shasta River (Siskiyou County).—Briefs on the motion to tax costs have been submitted and the matter is now pending decision by the superior court.

Clover Creek (Shasta County).—The Clover Creek case in pending in the superior court of Shasta County awaiting the court hearing, which has been set for December 5, 1933.

WATER DISTRIBUTION

Cedar, Davis, Deep, Emerson, Franklin, Mill, New Pine, Pine, Cottonwood, Owl, and Soldier creeks and South Fork of Pit River (Modoc County).—Water master service was continued throughout the month, to the extent that appeared necessary.

Pit River in Big Valley (Modoc and Lassen counties).—Supervision of diversions from Pit River in Big Valley was discontinued for the season, on September 30th.

Hat, Burney, North Cow, Oak Run and Clover creeks (Shasta County).—Water master service on these streams was continued throughout the month, to the extent that appeared necessary.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

Field and office work on this project has continued on a reduced basis and has included measurements and compilations of the stream flow, diversions, and return flow throughout the Sacramento-San Joaquin territory and salinity and tidal fluctuations in the delta. The census of crops irrigated under all diversions measured is nearing completion.

Due to increased return flow and diversion reductions, the flow of the Sacramento River at Sacramento has increased during the past month to about 3500 second-feet and similarly the flow of the San Joaquin River near Vernalis is now about 1000 second-feet.

With one or two exceptions there has, during the past month, been a marked recession in salinity at the various delta sampling stations. This as indicated in the following comparison of salinity on September 10th and October 10th. The maximum salinity for the season closely paralleled or slightly exceeded the 1929 maxima. The figures for salinity on October 10, 1929, and 1926 are shown in the following tabulation:

Salinity at Upper Bay and Delta Stations in Parts of Chlorine per 100,000

Station	September		October 10th	
	10, 1933	1933	1929	1926
Point Orient	1760	1760	1740	1930
Bullshead	1160	1260	1110	1340
Bay Point	1140	860	960	1330
O. and A. Ferry	900	680	470	620
Collinsville	620	460	340	340
Emmaton	290	210	65	78
Three Mile Slough	250	90	31	62
Rio Vista	102	13	3	12
Isleton	25	5	2	10
Antioch	480	*460	280	460
Jersey	210	130	95	152
Central Landing	23	13	7	19
Middle River	11	12	17	69

* October 6th.

DAMS

To date there have been received 824 applications for approval of dams built prior to August 14, 1929, of which 505 are now under jurisdiction. One hundred eighteen applications have been received for approval of plans for construction of enlargement of dams and 389 for approval of plans for repair, alteration and removal.

Definition of Feeder Road Discussed

(Continued from page 9)

roads and this should be decided by the states themselves. One thought advanced was that the Federal Government should appropriate money to build feeder roads after the Federal aid system had been completed.

Another expression in this connection was that the states should take over all roads outside of city streets in incorporated cities and a new method of securing right of ways be instituted. One suggestion was that adjacent property should relieve the State of some of the costs of rights of way.

It was the general opinion that Congress was not dictating to the states how to build roads and a misinterpretation of the activity of the U. S. Bureau was the cause of this conception occasioned by the bureau's recommendations.

An opinion was offered that feeder roads should be classified in respect to traffic and local advantages. If the local advantage prevailed it should be a local charge. Another statement presented was that the Federal Government should bear the entire cost of all roads of a transcontinental character.

FEEDER ROAD DEFINED

The oft-repeated question since the N.R.A., "What is a feeder road?" came up in this meeting and Thomas H. MacDonald of the U. S. Bureau of Roads said the best he could offer was that any road not on a Federal aid system might be termed a feeder road.

A point was brought out that the countries of Europe were not troubled over classification of roads and that all of their roads were highly developed. This can be easily understood. Where this condition does exist in Europe we find that the area of those countries is about equal to the size of our smaller states.

The final conclusion on this particular subject was that Federal policies in connection with highway construction should not prevail without the states being considered and that national roads might be classed as those rendering national service such as transcontinental highways and State highways classed as those rendering State service, while roads of local importance only and not carrying traffic of state-wide character might be classed under some other designation. However, in the opinion of the writer roads are roads.

BY-PASSING OF CITIES

In discussing the proper formula for dividing the cost of railroad crossing elimination, a point was made by Mr. James of the U. S. Bureau of Roads that the cost should be apportioned as to benefits and that some railroads would have different benefits according to whether the train movement was morning, noon, evening or night.

Another subject that seemed to have unanimous approval was that in the interests of the traveling public the through traffic lane should be given every consideration in its construction to take care of through traffic and that the by-passing of cities would be very necessary in the near future because the cities themselves would be unable to give the police control required and that a master plan should be worked out by all the states, elim-



DIRTY LOOKS and sarcastic words are being exchanged by Chairman Harry Hopkins of the Highway Commission (left) and Commissioner W. W. Barham anent the merits of their respective catches of Klamath River fish caught during a recent inspection trip over northern roads.

inating as far as possible the hazards brought about by routing main traffic lanes through cities.

In discussing the best method to control and enforce the minimum wage and labor hour it was brought out that while the thirty hours provided for by the National Recovery Act would cause a good spread of money and labor, it is too short a period for the average man to earn sufficient for the needs of his family and that provisions should be made for forty hours per week and up to 170 hours per month.

WANTS FORTY-HOUR WEEK

T. H. MacDonald of the U. S. Bureau of Roads brought out the fact that we have thirty hours and that it must be adhered to, but that future legislators should provide for the 40-hour week.

In discussing the danger of ruining the United States numbered system it was brought out that the numbers applied to the different highways are not intended for local community advantage or benefit, but to indicate the most direct route over the best highway between given points.

The resolutions committee presented a resolution that was unanimously passed by the delegates providing for a revision of the United States numbered system. Odd numbers extend from north to south and even numbers from east to west, and are in multiples of ten. The numbers were intended to be consecutive in designating different routes. However, this is not entirely the case at the present time, nor do numbers follow the most direct route.

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\$6,483,850 is October Record Total in Contracts Awarded and Advertised

OVER TWO MILLION six hundred thousand dollars in contracts awarded!
OVER TWO MILLION nine hundred thousand dollars in projects advertised!

OVER NINE HUNDRED THOUSAND dollars in maintenance work begun!

A RECORD BREAKING TOTAL OF NEARLY SIX AND ONE-HALF MILLION dollars for construction and maintenance on State highways for October, 1933.

These statements are not promises, they represent accomplishment—one month's accomplishment by the Division of Highways in advancing recovery in California through the means of State highway construction.

They represent jobs for 4500 Californians, jobs which will furnish food, clothing, fuel and shelter for their families during the coming winter.

RECOVERY COOPERATION

These figures likewise represent the results of the cooperation between the State and Federal governments in rushing the program for recovery, so that the recovery may be an actuality.

The work represented by the October portion of the Department of Public Works program for speeding recovery spreads over California from north to south and from the Sierra to the Pacific.

In a comprehensive and studied effort to bring the activity of highway construction to all parts of the State, the Division of Highways included work in 27 counties in the major construction projects set in motion during October and the work covered by miscellaneous projects and maintenance extends to all 58 counties.

To provide an adequate perspective of the picture of the intensive activity in highway construction during the month, the following tabulation is given, showing amounts of contracts financed from Federal funds allocated to California under the National Industrial Recovery Act, amounts financed from State funds and the approximate number of men who will be given jobs by virtue of the work:

	Federal funds	State funds	Total	Approx. No. men
Construction	\$1,615,400	\$750,900	\$2,366,300	2,000
Maintenance		152,800	152,800	145
Minor Improvements		32,400	32,400	25
Miscellaneous Projects		58,000	58,000	60
Maintenance Work Orders		944,300	944,300	400
Projects Advertised	1,032,000	1,898,050	2,930,050	1,870
Totals	\$2,647,400	\$3,836,450	\$6,483,850	4,500

The following tabulations present different views of the major construction work in the picture for October, showing the types of work, mileage, amounts and number of men required for the various types, on the 31 contracts awarded during the month and the 19 projects advertised.

CONTRACTS AWARDED

Type	Miles	Federal funds
Pavement	16.7	\$596,200
Bituminous Tr. Gravel or Stone Surface	36.4	407,600
Shoulder Treatment	25.0	
Graded Roadbed	9.6	114,000
Bridges and Grade Separations	(16)	497,500
Totals	87.7	\$1,615,300

Type	State funds	Total	No. of men
Pavement	\$165,900	\$762,100	635
Bituminous Tr. Gravel or Stone Surface	112,700	520,300	445
Shoulder Treatment	26,500	26,500	25
Graded Roadbed	147,200	261,200	220
Bridges and Grade Separations	298,700	796,200	675
Totals	\$751,000	\$2,366,300	2,000

PROJECTS ADVERTISED

Type	Miles	Federal funds
Pavement	11.1	\$498,000
Bituminous Tr. Gravel or Stone Surface	15.3	182,700
Shoulder Treatment	24.4	
Graded Roadbed	16.3	335,900
Dredger Fill and Rock Wall, East Approach to San Francisco Bay Bridge	4.1	
Bridges	(3)	15,400
Totals	71.2	\$1,032,000

Type	State funds	Total	No. of men
Pavement	\$130,000	\$628,000	525
Bituminous Tr. Gravel or Stone Surface	96,600	279,300	235
Shoulder Treatment	62,200	62,200	50
Graded Roadbed	233,100	569,999	475
Dredger Fill and Rock Wall East Approach to San Francisco Bay Bridge	1,358,300	1,358,300	550
Bridges	17,850	33,250	35
Totals	\$1,898,050	\$2,930,050	1,870

Supplementary to the above tabulations the following details are given of bids opened and contracts awarded on the larger projects between September 13th and October 29th when 112 projects figured in the bidding:

(Continued on page 30)

U.S. Gas Tax Repeal Favored by Highway Officials in Convention

(Continued from page 25)

The question of double taxation for highways, both Federal and State, disclosed the generous sentiment that a dependable taxation should be worked out that would stand the attack of all critics and the best results would follow.

The tax should be governed by the payer and all State gas tax should be spent or its expenditure controlled by the State and not by political subdivisions of the Federal government. There was a strong sentiment in favor of repealing the Federal Gasoline Tax.

A provision of the National Recovery Act wherein the State highway departments may build highways between points where unprofitable railroad lines are abandoned was discussed and it was disclosed by the U. S. Bureau of roads that upon their request for routes and mileage that the railroads would like to abandon in the whole United States, the railroads only suggested a total of about four hundred miles. However, when they asked for suggestions from the railroads covering feeder roads they suggested several thousand miles.

In discussion of the cost of grade eliminations many thought the Federal government should stand the entire cost. The next sessions of the states' legislatures as well as the next Congress might give this subject serious consideration. However, there should be a uniformity of legislation by the states, and highway crossing separations should have as much consideration.

GRADE SEPARATION FINANCING

The cooperative method of grade separations is followed in most of the states and should legislation relieve the railroads from any participation, would their cooperation return in the future? In view of the fact that the Federal government is now a large stockholder in the railroads of this country and will probably remain so, it is doubtful, should legislation be passed, that they would ever participate again.

It was also suggested that if participation by railroads on grade separation does not add to revenue they should not have to pay any of the cost. It is a delicate subject because when we consider the railroad we have to consider the highway and when we consider the highway we consider it from the county road standpoint as well as that of the State highway and many property owners have paid assessments in connection with highway construction where their property was not benefited or enhanced in value one thin dime.

FEDERAL AID ASKED

The many problems presented to the delegates were so numerous that it is impossible to go into them to any extent or even mention many of them. During this time of economic distress highway construction and maintenance has developed into the biggest industry in this country. During the year 1932 the total expenditures through the State highway departments was \$816,765,481 and the total revenue was \$898,317,394. In expenditures, construction got \$551,445,859 and maintenance got \$169,479,339.

Three New Highways Will Connect Desert and Mountain Areas

(Continued from page 10)

fork of the west fork of Mojave River, known as Miller Canyon. This canyon is almost entirely owned by the public and any who have not been down into this area will be pleasantly surprised when they make the trip. The forests are as lovely as any in Southern California with virgin timber of yellow pine, oaks, jeffrey pines and dogwood. A beautiful stream follows the bottom of the canyon.

"The route to the desert from Lake Arrowhead is better known.

"The Cushionberry Grade into the Big Bear Lake area is the third routing to be taken over connecting with the desert. It is one of extreme interest having been constructed by way of Coxey's Ranch and Holcomb Valley about 1856. This road was constructed because of the discovery of gold in Holcomb Valley and the pioneer miners toiled up the steep grades to what they hoped would prove a new southland El Dorado.

"From these desert connections the public in the winter and early spring will pass through valleys of flowers to the Cajon Pass and again enter the San Bernardino Valley on the splendid highway lately constructed through the pass."

NOVEL CAISSON METHODS ADOPTED FOR BAY BRIDGE

(Continued from page 15)

are timbered over and the timbers held in place by means of strong backs.

Just as in the other caissons the walls of these are built up and concrete poured around the cells. When it lands on the bottom of the bay, derricks jerk the strong backs free at the bottom of each of the fifteen cells and the timbers which have made the cells watertight for the purpose of flotation are removed and floated to the top; thus each cell is open to the bottom of the bay. Clamshell dredges are then lowered down each cell and the mud is excavated therefrom until the caisson is allowed to rest at its final elevation, in the case of Pier E-5 approximately 170 feet below the surface of the water. * * *

He: "That soprano has a large repertoire, hasn't she?"

She: "Ain't it the truth, and her dress only makes it look worse."—*Exhaust.*

67 Steers Barbecued to Provide Feast at Highway Celebration

(Continued from page 6)

An average of 300 men were employed, working on a basis of 30 hours per week.

An old-fashioned California celebration and free barbecue at the ranch of Senator Waggy on the new highway 41 miles west of Taft, marked the official opening ceremonies. A great throng, estimated at 25,000 people, attended the celebration, and some 10,000 partook of the barbecue for which 67 beeves were slaughtered. The festivities began at 10.30 a.m. and lasted all day with costumed Spanish singers and dancers entertaining between periods of the formal exercises.

Supervisors Stanley Abel and Charles Wimmer of Kern County, Thos. Clark and Charles Butts of Ventura County and Samuel Stanwood of Santa Barbara County, represented the tri-county district whose cooperation brought about the completion of the highway.

Guests from neighboring counties included Supervisors John R. Quinn of Los Angeles County, Hartwell Sumners and Charles E. Crowell of Stanislaus County.

John Lagomarsino was chairman of the tri-county committee in charge of the celebration. In addition to Chairman Harry A. Hopkins of the Highway Commission, the State was represented by Commissioner Timothy A. Reardon of San Francisco and Morgan Keaton, Assistant Deputy Director of Public Works from Sacramento.

CONCLUSION

(Continued from page 22)

We can only expect to come out of the depression by developing work and plenty of it.

Let us own our own water and power. They will belong to the State and that is you, the people. The Bay Bridge, the Southern California Water Plan, the Boulder Dam, the highways, and all other State and municipal projects will make California the foremost State in the Union.

We have the shipping facilities; the markets of the world are at our doors, principally in the Orient. Developments of water and power will insure our prosperity with a guarantee of employment and the maintenance of our agricultural and manufacturing industries. As for markets there are approximately 900 millions of human beings ready to buy our manufactured goods and eat our surplus of food supplies and this project costs you nothing but your effort to vote "Yes" on December 19, 1933.

30,267,000 Yards of Overhaul Required for Ridge Alternate

(Continued from page 17)

a route would have been prohibitive at that time. There were but 1,023,000 cubic yards of excavation on the old route—on the new there were 4,252,000 cubic yards. But such improvement has been made in equipment that the unit cost was 30 cents on the new route as compared with 42 cents on the old for excavating and the haulage unit was only one-third of the old price.

The old route required but 393,000 station yards of overhaul while the new route has required 30,267,000 station yards.

To construct a highway on the location and to the standards of the new route at the time the old route was constructed would have cost more than \$2,500,000 which would not have been justified at that time, either from the volume of traffic or from the amount of money available for the purpose.

BLOW TO SECTIONALISM

Although the hauling of freight is only a small percentage of the total savings which can be credited to the new route, commercial organizations have been quick to realize the large savings which can be effected in hauling agricultural produce from the vast farming areas of the San Joaquin Valley to the metropolitan area at Los Angeles over this new high speed highway as well as by the interchange of freight between southern California and central and northern California. While the savings in freight haul will be large, by far the greatest benefit will accrue to the thousands of motorists, not only from California, but from every part of the country, who use this highway. Not only will there be an appreciable savings in car operating expense but also a large saving of time and the increased comfort and safety of traveling across this mountain range on a highway of modern standards of alignment and grade. As Commissioner Stanton aptly put it in his speech at the dedication ceremony, completion of this new highway unit is truly "the greatest blow to sectionalism in California since the construction of the original Ridge Route in 1915."

"FAG STATIONS" ESTABLISHED FOR SMOKERS IN FORESTS

Smoking has been prohibited in all National forests in California except at "fag stations" established along trails and roads and at camps and places of habitation, according to decree just issued by Regional Forester S. B. Show. A report states that 999 fires in 1932 were caused by lighted matches and burning tobacco being thrown into dry litter of the forest and dry grass and grain fields of the State. One of these fires burned over 219,000 acres of watershed in the Santa Barbara forest.

The motor bus was proceeding rather jerkily, when a pretty young woman passenger asked: "What's wrong with this bus, driver?"

"The engine misses," he replied.

The young woman blushed and smiled. "Why, I've only been married two weeks!" she exclaimed. "How in the world did you know?"—*Motor Land*.

Radiotelephones of Bay Bridge Speeding Work, Saving \$15,000

RADIOPHONES on the San Francisco-Oakland Bay Bridge may appear to be an innovation to the public, but to the engineers on this world's largest construction job they are a necessity.

Although no other bridge or, for that matter, no other known construction job, has used radiotelephones, the San Francisco-Oakland Bay Bridge is larger by two or three times in length than any other bridge in the world, and this length complicates means of communication tremendously.

It requires from 5 to 40 minutes for the bridge boats to go to the various piers and construction points on the San Francisco-Oakland Bay Bridge, according to the speed of the boat and the distance involved. This is not considering the time required in going from the bridge office down to the boat on the waterfront.

OPERATION IS SIMPLE

By means of the Tibbetts radiotelephones with which the bridge construction offices and isolated points have been equipped, an engineer in the San Francisco-Oakland Bay Bridge office at Sansome and Clay Streets, San Francisco, can take down the receiver, tip the tiny lever for calling, and switch it on to receiving until he gets an answer from a distant pier out on the water. He then switches the radiotelephone to broadcasting and talks into the telephone. At the end of his speech the engineer says, "Get ready," and switches from a broadcasting set to a receiving set by the pressure of the lever. The man on the isolated pier in the bay then speaks his message, announces, "Get ready," and switches to reception so that he can receive a reply from the bridge office.

Engineers, who have now used the radiophones daily for the fortnight in which they have been in use, say they prefer them to the standard telephone because there are no interruptions—only one person can talk at a time, and the messages are clear and succinct.

SAVING TIME AND MONEY

The time and money saved by these radiotelephones over the method of sending messengers would run to a staggering figure. When it is considered that the bridge will be in construction over a period of four years, and that each trip of a messenger involves the



HELLO FROM BAY—Inventor D. Reginald Tibbetts speaking by radiotelephone from a work barge to the San Francisco-Oakland Bay Bridge offices in city.

time of the messenger, two boatmen, the depreciation of the boat, its gasoline and upkeep, plus automobile service to and from the boat, or other land transportation, it can be seen that the saving would reach a tremendous figure.

If only one such message were sent a day, the cost would approximate \$15,000, in the opinion of engineers on the job.

The great value of the radiophone, though, is the speed with which communications may reach isolated places, the accuracy of such messages, and the effect of this speed and accuracy on the progress of construction.

AVOIDS COSTLY DELAYS

The cost of the lack of this radiophone service would only partially appear in the cost of sending messengers. The great increased cost would go in the mistakes, difficulties and delays of expensive construction units occasioned by inability of the engineers and contractors to guide the efforts of the workmen at all times.

Green gives you the right-of-way. This is especially true of the long green.—*Buckeye Motorist.*

Highway Bids and Awards

September 15th to October 15th, Inclusive

(Continued from page 26)

BUTTE COUNTY—At W. Branch Feather River, 14 miles north of Oroville, reinforced concrete bridge, one 155-ft. arch span, three 40-ft. girder spans and six 38-ft. girder spans. District II, Route 21, Section B. Lord & Bishop, \$70,974; M. B. McGowan, San Francisco, \$73,215; Bodenhamer Const. Co., Oakland, \$69,738; Rocco & Caletti, San Rafael, \$62,644; Neves & Harp, Santa Clara, \$63,112. Contract awarded to F. C. Amorosa & Sons, San Francisco, \$59,930.

COLUSA AND GLENN COUNTIES—Between Maxwell and Norman, 7.1 miles grade, surfacing. District III, Route 7, Sections C, A. Basich Bros., Torrance, \$110,284; D. McDonald, Sacramento, \$163,937; Larsen Bros., Sacramento, \$129,142; Union Paving Co., San Francisco, \$125,650; A. Teichert & Son, Sacramento, \$135,338; Hemstreet & Bell, Marysville, \$142,992; Clyde W. Wood, Stockton, \$123,205. Contract awarded to Peninsula Paving Co., San Francisco, \$103,432.75.

CONTRA COSTA COUNTY—In Valona, 0.2 mile grading, paved with asphalt concrete. Contract awarded to Southern California Roads Co., Los Angeles, \$32,158.60.

DEL NORTE COUNTY—Between Last Chance Slide and Flannigans, 9.5 miles graded and surfaced with crushed run base and untreated crushed gravel or stone. District I, Route 1, Section B. Hanrahan Co., San Francisco, \$806,030; MacDonald & Kahn, San Francisco, \$845,640; Mercer-Fraser Co. & George Pollock Co., Sacramento, \$713,961. Contract awarded to Youdall Const. Co. and Chas. Harlowe, Jr., San Francisco, \$678,799.

HUMBOLDT COUNTY—Between Benbow and 7 miles north of Garberville, 7.6 miles grading and surfacing with screened gravel. District I, Route 1, Sections A, B. Clyde W. Wood, Stockton, \$347,010; Isbell Construction Co., Carson City, Nevada, \$559,408; George Pollock Co., Sacramento, \$443,257; Fredrickson & Watson, Oakland, \$387,005. Contract awarded to Mittry Bros., Los Angeles, \$334,206.

IMPERIAL COUNTY—Between No. Boundary and Trifolium Cana., 25 miles oil treated crushed gravel

borders. District VIII, Route 26, Sections A, B, C, D, E. B. G. Carroll, San Diego, \$94,959; Griffith Company, Los Angeles, \$84,587; V. R. Dennis Const., San Diego, \$141,900; R. E. Hazard Const. Co., San Diego, \$79,770; United Concrete Pipe Corp., Los Angeles, \$75,290. Contract awarded to Oswald Bros., Los Angeles, \$71,000.

IMPERIAL COUNTY—Between 4 miles west of Westmoreland and Trifolium Canal, 3.2 miles to be graded and paved with Portland cement concrete. District VII, Route 26, Section A. Griffith Co., Los Angeles, \$74,869; Weymouth Crowell Co., Los Angeles, \$80,425; Walter Treppe, San Diego, \$79,832. Contract awarded to Oswald Bros., Los Angeles, \$74,624.

KERN COUNTY—Between Pierce Road and Tank Farm, 2.1 miles grading, paving with asphalt concrete. District VI, Route 4, Section G. Basich Bros., Torrance, \$101,255; Gogo & Rados, Los Angeles, \$115,781; Hauser & Garnett, Glendale, \$116,050. Contract awarded to Union Paving Co., \$97,061.25.

LOS ANGELES COUNTY—Between Santa Clara River and Castaic School, 5.1 mile to be graded and paved with Portland cement concrete. District VII, Route 4, Section A. P. J. Akmadzich, Los Angeles, \$138,600; Jahn & Bressi Const. Co., Los Angeles, \$137,163. Contract awarded to Griffith Company, Los Angeles, \$101,803.

LOS ANGELES COUNTY—Between Orange Avenue and Barranca Street, 3.8 miles to be paved with Portland cement concrete. District VII, Route 26, Section C. Basich Brothers, Torrance, \$146,989; Griffith Company, Los Angeles, \$147,354; Jahn & Bressi, Los Angeles, \$156,989; Weymouth & Crowell Co., Los Angeles, \$177,823; Southern Calif. Roads Co., Los Angeles, \$163,587; C. O. Sparks, Los Angeles, \$152,272; J. L. McClain, \$151,153; Sander Pearson, Santa Monica, \$166,919. Contract awarded to Oswald Bros., Los Angeles, \$144,668.

LOS ANGELES COUNTY—Between Colby Canyon and Mt. Wilson Road, about 4 miles to be graded. District VII, Route 61, Section A. Sharp & Fellows,



OPENING THE FIRST BID on September 13th, when 89 bidders competed for 13 contracts totaling \$1,220,551. Earl Lee Kelly (center), Director of Public Works, urged successful bidders to speedily put men on the jobs. At Mr. Kelly's left are Deputy Director Eric Cullenward and Assistant State Highway Engineer George T. McCoy. At his right, J. G. Standley, Acting Principal Assistant Engineer, and George Gunston, Disbursing Officer.



STANDING ROOM ONLY and very little of that was available at the September-October bid openings held twice a week in the Highway Commission board room.

Los Angeles, \$516,825; Morrison-Knudsen Co., Los Angeles, \$467,662; George Pollock Co., Sacramento, \$346,466; Guy F. Atkinson Co., San Francisco, \$388,849; Von der Hellen & Pearson, Castaic, \$391,258; Mittry Bros. Const. Co., Los Angeles, \$348,704. Contract awarded to Jahn & Bressi Const. Co., Los Angeles, \$297,529.

LOS ANGELES COUNTY—Between State Street and Anaheim Street, Long Beach, 0.8 mile to be graded and paved with Portland cement concrete. District VII, Route 60, Section F. J. L. McClain, Los Angeles, \$40,661; Kovacevich & Price, Southgate, \$41,002; Weymouth & Crowell, Los Angeles, \$44,487; Sander Pearson, Santa Monica, \$43,902; Griffith Company, Los Angeles, \$39,007. Contract awarded to United Concrete Pipe Corp., Los Angeles, \$38,712.

LOS ANGELES COUNTY—Between Oakes Garage and Palmdale, 5 miles bituminous surfacing, super-elevating, etc. District VII, Route 23, Sections D, E. Geo. K. Thompson, Los Angeles, \$45,752; Granite Construction Co., Watsonville, \$40,932; Southwest Paving Co., \$52,386; T. C. Rogers, Los Angeles, \$44,155; P. J. Akmadzich, Los Angeles, \$53,075; Gibbens and Reed, Burbank, \$51,464. Contract awarded to Griffith Company, Los Angeles, \$35,090.

MARIN COUNTY—In Sausalito between Napa and Water Streets, 0.4 mile grading, paving with asphalt concrete. District IV, Route 1, Section C. Vincent Maggiora, Sausalito, \$49,884; Pacific States Const. Co., San Francisco, \$48,043. Contract awarded to A. J. Raisch, San Francisco, \$46,437.30.

MARIPOSA COUNTY—Between Orange Hill School and Mariposa, 15.1 miles surfaced with gravel and bituminous seal coating. District VI, Route 18, Sections A, I, J. Basich Brothers, Torrance, \$188,012; Clyde W. Wood, Stockton, \$236,026; George Pollock Co., Sacramento, \$243,505; Hemstreet & Bell, Marysville, \$219,528; Union Paving Co., San Francisco, \$173,014; Jack Casson, Hayward, \$198,582; A. Teichert & Son, Sacramento, \$183,585; E. B. Bishop & Charles Harlowe, Jr., Sacramento, \$242,506; M. J. Bevanda, Stockton, \$197,412. Contract awarded to Fredrickson & Watson Oakland, \$146,094.

MENDOCINO COUNTY—Between Ukiah and Hopland, 9.5 miles bituminous surfacing. District IV, Route 1, Section B. Granite Const. Co., Ltd., Watsonville, \$48,518; A. Teichert & Son, \$57,090; J. C. Compton, McMinnville, Ore., \$51,405; E. A. Forde, San Anselmo, \$46,272; Pacific Truck Service, Inc., San Jose, \$49,777. Contract awarded to Clyde W. Wood, Stockton, \$45,600.

MENDOCINO COUNTY—Bridge across Russian River near Hopland, consisting of one 247-ft through steel truss span on concrete piers, and 21 steel beam spans 889 feet long on reinforced concrete pile bents and 2 concrete abutments. District IV, Route 1, Section L. Lindgren & Swinerton, Inc., San Francisco, \$136,988; J. F. Knapp, Oakland, \$135,490; M. B. McGowan, Inc., San Francisco, \$135,281; Bodenhamer Const. Co., Oakland, \$147,940; Fredrickson & Watson Const. Co., Oakland, \$145,713; Rocca & Caletti, San Rafael, \$136,862; K. E. Parker Co., San Francisco, \$148,458; Mercer-Fraser Co., Eureka, \$146,413; MacDonald & Kahn Co., Ltd., San Francisco, \$147,899; Barrett & Hilp, San Francisco, \$140,251; Neves & Harp, Santa Clara, \$139,881. Contract awarded to J. H. Pomeroy & Co., San Francisco, \$133,518.10.

MONO COUNTY—Between Crestview and 2.2 miles south of Rush Creek, 9.7 miles to be graded, surfaced with selected material and bituminous treatment applied. District IX, Route 23, Sections F, G. Union Paving Co., San Francisco, \$312,983; Isbell Construction Co., Carson City, Nev., \$216,318; Morrison-Knudsen Co., Los Angeles, \$212,800; Hemstreet & Bell, Marysville, \$201,477; Basich Bros., Torrance, \$194,345. Contract awarded to Southwest Paving Co., Los Angeles, \$191,235.

MONO COUNTY—Between Point Ranch and Dressler's Corner, 6.2 miles grading and surfacing with bituminous treated gravel. District IX, Route 23, Section I. Isbell Const. Co., Carson City, Nevada, \$155,262; Southwest Paving Co., Los Angeles, \$135,944; Hemstreet & Bell, Marysville, \$124,997. Contract awarded to Basich Bros., Torrance, \$117,005.80.

MONO COUNTY—Between 2 miles north of Lee-vining and Mono Inn, 2.9 miles to be graded, surfaced,

(Continued on page 32)

Highway Bids and Awards

(Continued from page 31)

and bituminous treatment applied. District IX, Route 23, Section H. Basich Bros., Torrance, \$60,405; Kennedy Const. Co., Oakland, \$89,996; Hemstreet & Bell, Marysville, \$64,353. Contract awarded to Isbell Construction Co., Carson City, Nevada, \$54,424.

MONTEREY COUNTY—Between Gonzales and Chualar, 6 miles grading and surfacing with asphalt concrete. District V, Route 2, Sections C, B. M. J. Bevanda, Stockton, \$165,526; Peninsula Paving Co., San Francisco, \$143,778; Gogo & Rados, Los Angeles, \$167,909; A. Teichert & Son, Sacramento, \$157,799; Granite Const. Co., Watsonville, \$169,300; Jones & King, Hayward, \$161,408; David H. Ryan, San Diego, \$158,818; Hanrahan Co., San Francisco, \$155,303. Contract awarded to A. J. Raisch, San Jose, \$141,745.

NEVADA COUNTY—Between 1 mile west of Washington Road and one-half mile east of Summit about 7.4 miles surfacing with bituminous treated gravel. District III, Route 15, Sections C, D. Basich Bros., Torrance, \$129,882; Hemstreet & Bell, Marysville, \$126,057.50; Central States Contracting Co., Oakland, \$130,860. Contract awarded to A. Teichert & Son, Sacramento, \$122,408.

PLACER COUNTY—Between Loomis and New-castle, 5.2 miles grading, paving Portland cement concrete and asphalt concrete. District III, Route 17, Sections A, B. A. Teichert & Son, Sacramento, \$241,929; Hanrahan Company, San Francisco, \$280,521; M. J. Bevanda, Stockton, \$265,385; Fredrickson & Watson, Oakland, \$247,528; Peninsula Paving Co., San Francisco, \$239,928; David H. Ryan, San Diego, \$247,773; Union Paving Co., San Francisco, \$246,858. Contract awarded to T. M. Morgan Paving Co., Los Angeles, \$234,057.

PLACER AND NEVADA COUNTIES—Between Drum Canal and Yuba Pass, 4.2 miles to be graded and surfaced with bituminous treated gravel. District III, Route 15, Sections A, E. The Utah Const. Co., San Francisco, \$250,170; Hemstreet & Bell, Marysville, \$325,224; Union Paving Co., San Francisco, \$247,826; Fredrickson & Watson Const. Co., \$268,793. Contract awarded to A. Teichert & Son, Sacramento, \$237,203.

RIVERSIDE COUNTY—Between Black Butte & Blythe, 9.2 miles to be graded and surfaced with oil treated crushed gravel. District VIII, Route 64, Section E. George Herz & Co., San Bernardino, \$64,437; W. E. Hall Co., \$64,405; A. Teichert & Son, Sacramento, \$54,049; Oswald Bros., Los Angeles, \$52,873. Contract awarded to Walter Trepte, San Diego, \$47,670.

SACRAMENTO COUNTY—Undergrade crossing under S. P. R. R. 1½ miles north of McConnell, to Cosumnes River Bridge, consisting of 2 concrete abutments with wing walls and grading, paving with Portland cement 0.37 mile approach. District III, Route 4, Sections A, B. George Pollock, Sacramento, \$92,019; Fredrickson & Watson, Oakland, \$91,455. Contract awarded to J. R. Reeves, Lord & Bishop, Sacramento, \$86,871.70.

SAN BERNARDINO COUNTY—A. R. C. Slab Bridge across San Timoteo Creek near Redlands consisting of two 33-ft spans and two 27-ft. spans on concrete pile bents and concrete abutments with wing walls on pile foundation. District VIII, Route 26, Section A. Dimmitt & Taylor, Los Angeles, \$38,064; United Concrete Pipe Corp., Los Angeles, \$46,192; John Oberg, Los Angeles, \$38,210; John Strona, Pomona, \$39,331; Herbert H. Baruch Corp., Los Angeles, \$42,918; Oscar Oberg, Los Angeles, \$40,795; Clinton Const. Co., Los Angeles, \$40,528; J. E. Haddock, Ltd., \$41,114. Contract awarded to R. B. Bishop, Long Beach, \$37,633.

SAN BERNARDINO COUNTY—An overhead crossing over The A. T. & S. F. Ry. in San Bernardino consisting of a steel and concrete viaduct 1016 ft. long and road approach to be graded and paved with Portland cement concrete. District VIII, Route 9, Section C. Herbert M. Barauch Corp., Los Angeles, \$230,442; Clinton Construction Co., Los Angeles, \$203,000; Weymouth Crowell Co., Los Angeles, \$199,486; Sander Pearson & Dimmitt & Taylor, Los Angeles, \$217,765; Byerts & Dunn, Los Angeles, \$213,666; Lynch-Cannon Engineering Co., Los Angeles, \$209,317; Morrison-Knudsen Co., Los Angeles, \$240,533; United Concrete Pipe Corp., Los Angeles, \$249,310; Lindgren & Swinerton, San Francisco, \$199,754; M. B. McGowan, Inc.,

San Francisco, \$211,670. Contract awarded to J. F. Knapp Oakland, \$189,985.

SANTA BARBARA COUNTY—Ellwood overhead; 0.8 mile grading, paving with Portland cement concrete. District V, Route 2, Section G. M. J. Bevanda, Stockton, \$68,187; Weymouth Crowell Co., Los Angeles, \$69,891; Western Motor Transfer Co., Santa Barbara, \$82,476; J. E. Haddock, Pasadena, \$67,610. Contract awarded to United Concrete Pipe Corp., Los Angeles, \$63,367.

SANTA CRUZ COUNTY—Between Inspiration Point and 1 mile north, 9.8 miles to be graded. District IV, Route 5, Section B. M. J. Bevanda, Stockton, \$70,574; Clyde W. Wood, Stockton, \$86,887; Fredrickson & Watson, Oakland, \$89,129; MacDonald & Kahn Co., San Francisco, \$111,574; Mitty Bros. Const. Co., Los Angeles, \$69,457; J. L. Conner & Kristich, Monterey, \$111,353; Granfield, Farrar & Carlin, San Francisco, \$84,825; Crow Bros., Los Angeles, \$73,934. Contract awarded to Union Paving Co., San Francisco, \$67,467.85

SHASTA COUNTY—Between Diddy Hill and Montgomery Creek, 1.5 miles to be graded; about 12.9 miles to be surfaced with crusher run base and about 12.9 miles to have bituminous seal coat applied. District II, Route 28, Sections A, B. Union Paving Co., \$181,977; M. J. Bevanda, Stockton, \$161,772; Hein Bros. Basalt Rock Co., Petaluma, \$124,797; Fredrickson & Watson, Oakland, \$133,128; Hemstreet & Bell, Marysville, \$126,954; F. B. Bishop, Sacramento, \$145,853; Isbell Construction Co., Carson City, Nevada, \$171,954; Heafey-Moore Co., Oakland, \$172,496. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$123,785.

SHASTA COUNTY—Between Boulder Creek and 1½ miles east of Bella Vista, 9.1 miles grading surfacing with bituminous treated gravel. District II, Route 28, Section A. A. Teichert & Son, Sacramento, \$199,362; Hanrahan Co., San Francisco, \$249,148; Isbell Construction Co., Carson City, Nevada, \$307,424; T. M. Morgan Paving Co., Los Angeles, \$240,377; Hemstreet & Bell, Marysville, \$225,170; D. McDonald, Sacramento, \$296,518; George Pollock Co., Sacramento, \$267,966; Union Paving Co., San Francisco, \$189,971. Contract awarded to Fredrickson & Watson Const. Co., Oakland, \$186,243.

SOLANO AND NAPA COUNTIES—Between Carquinez Bridge and Cordelia (American Canyon Cut-off), 10.3 miles grading. District X, Route 7, Sections F, G, H. A. George Pollock Co., Sacramento, \$460,452; C. R. Adams, Piedmont, \$579,359; Union Paving Co., San Francisco, \$563,451; Isbell Const. Co., Carson City, Nevada, \$589,375; Mitty Bros. Const. Co., Los Angeles, \$418,501; Fredrickson & Watson, Oakland, \$409,943; Utah Const. Co., San Francisco, \$718,644; Guy F. Atkinson Co., San Francisco, \$465,131; C. W. Wood, Stockton, \$439,661; Hemstreet & Bell, Marysville, \$446,964; Jahn & Bressi Const., Los Angeles, \$406,585. Contract awarded to Granfield, Farrar & Carlin, San Francisco, \$383,769.15.

SONOMA AND MENDOCINO COUNTIES—Between Cloverdale and Hopland, 13.9 miles surfacing with rock base. District IV, Route 1, Sections D, L. Clyde W. Wood, Stockton, \$198,725; George Pollock Co., Sacramento, \$197,525; Peninsula Paving Co., San Francisco, \$128,323; Hein Bros., Basalt Rock Co. & Geo. French, Jr., Petaluma-Stockton, \$238,325; Granfield, Farrar & Carlin, San Francisco, \$128,650; Fredrickson & Watson Const. Co., Oakland, \$143,550; A. Teichert & Son, Sacramento, \$157,475. Contract awarded to Basich Bros., Torrance, \$115,905.

TEHAMA COUNTY—Between Red Bluff and 1½ miles east of Dales, 13.3 miles grading. District II, Route 29, Section A. Heafey-Moore Co., Oakland, \$271,810; Isbell Const. Co., Carson City, Nevada, \$408,252. Contract awarded to Hemstreet & Bell, Marysville, \$198,183.

TULARE COUNTY—Between W. Boundary and 2 miles south of Plaza Garage, 5 miles to be graded and paved with asphalt concrete. Basich Brothers, Torrance, \$84,925; Valley Paving & Const. Co., Fresno, \$95,787; P. J. Akmadzich, Los Angeles, \$106,908. Contract awarded to Union Paving Co., San Francisco, \$75,931.

STATE OF CALIFORNIA

Department of Public Works

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EARL LEE KELLY-----Director
ERIC CULLENWARD-----Deputy Director
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HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

O R E G O N

CENTRAL VALLEY PROJECT OF STATE WATER PLAN

Scale of Miles

0 20 40 60 80



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CALIFORNIA

HIGHWAYS AND PUBLIC WORKS



PYRAMID ROCK IN PIRU GORGE ON NEW RIDGE ALTERNATE

Official Journal of the Department of Public Works

DECEMBER 1933

SHATTUCK PIRU GORGE

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"THE FORGOTTEN MAN"

Director of Public Works Describes Plight of "the White Collar" Job Seeker and the Problem of Providing him Relief Employment for Winter on the Highways

By EARL LEE KELLY, Director of Public Works

"THE FORGOTTEN MAN."

Perhaps the most distressing problem to face and the hardest one to solve in the Department of Public Works, is that of trying to find work for the thousands, who, month after month, besiege these offices.

One little story regarding the awarding of a contract; one mention in the press of the possibility of additional projects being launched by the Department of Public Works—and a veritable flood of fine real citizens out of employment descends upon headquarters. Four hundred men appeared between eight o'clock and noon of a certain Monday morning recently following publication in the local press that this department had prepared 1871 projects which could employ 20,596 men if such projects were accepted by the C. W. A. The little "if" was what these men, desperate to find an honest means of earning their living, had overlooked in the story.

"The Forgotten Man."

Unemployment is still a major problem of this State. It is true that the Federal government's efforts to relieve the county relief rolls have had good effect. But there are still on our records, thousands of names of men seeking permanent work.

But the "Forgotten Man" is the most pitiable case with which we have to deal. He is the salesman, the insurance broker, the clerk—the so-called white collar man. He probably has never done one bit of manual labor in his life. Civil service regulations bar him from the office job to which he might be fitted. A physique used to indoor work bars him from manual labor. He is indeed "The Forgotten Man."



EARL LEE KELLY

It is for this man that the department of Public Works relief work each winter, has been a salvation. The approximately 4120 whom we will employ throughout this winter is made up for the greater part of "The Forgotten Man." Provided he has dependents, this citizen is put on regular maintenance work, but at half time instead of full time. Our winter relief workers are employed for eight hours a day at \$4.40 per day, five days a week, with a lay-off each second week; in other words, he is employed to earn \$22 every other week. By this stag-

gering we are able to employ twice as many as we ordinarily would.

First crews began this employment December 4th. Additional men are being added each week until by the first of January we anticipate more than 2000 will be thus employed.

(Continued on page 8)

American Canyon Job Involves 1,166,000 Yards Excavation, 14,000,000 Overhaul

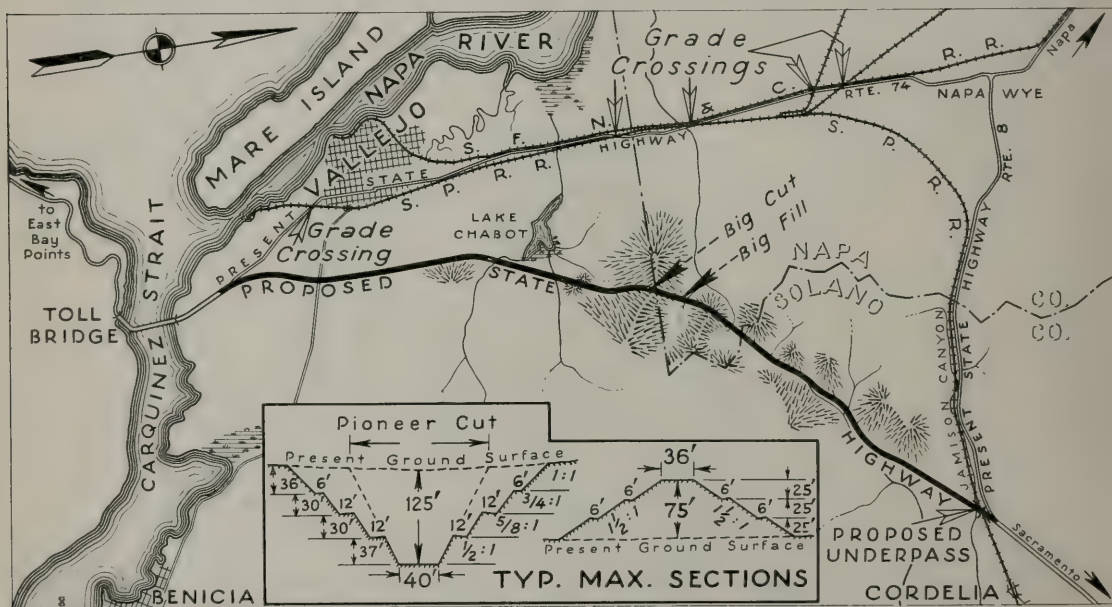
By R. E. PIERCE, District Engineer

ON October 9, 1933, the first shovel of earth was dug by the contractor on the so-called American Canyon Cut-off, thus starting the project which will shorten the distance between San Francisco and Sacramento by six miles and make a vast improvement in alignment and saving in time on this important transcontinental artery.

This cut-off has been in the minds of many interested people for years, and in fact was originally surveyed by State Highway engineers in 1926. At that time this cut-off was

reached between the State and Solano County, in which the county agreed to take over and maintain the present State highway from Cordelia to Benicia, as a county road, and the State agreed to construct and maintain the American Canyon Cut-off and to take over and maintain the Vallejo-Benicia Road from the American Canyon Cut-off to Benicia.

Since that time a further study of the route proposed has been made by the Survey and Plans Department and a radical change recommended which, while involving very heavy



ROUTE of American Canyon Cut-off and cross-section plan for terraced cuts and fills.

not a part of the State Highway System and the matter of financing a survey caused some concern. This was solved by funds in the amount of \$4,500 being provided by the boards of supervisors of Solano and Napa counties, each contributing one-half the amount, or \$2,250. This appropriation was agreed upon after the advantages of the new route had been pointed out to them.

STATE MAKES AGREEMENT

After this survey the matter lay dormant until about 1929, when an agreement was

grading and some adverse grade, makes an additional saving of about a mile in distance and improves the alignment. This change is considered worth while on account of the importance of this route and the volume of present and probable future traffic.

The work now under contract consists, in the main, of grading and drainage structures. In volume of excavation this project ranks among the largest ever handled in a single State contract, there being an estimated total of 1,166,000 cubic yards set up

(Continued on page 12)



"BIG CUT" of the American Canyon cut-off project where a total of 520,500 cubic yards will be moved. The cut is 2400 feet long with 130-foot maximum depth.



"BIG FILL," adjacent to the "Big Cut," is 2500 feet long, with a maximum height of 75 feet, requiring 605,600 cubic yards of material.



TERRACING OPERATIONS in the "Big Cut" are shown in this picture. A shovel and truck are making a 12-foot terrace along the left slope. Fills will also be terraced.

Annual Battle With Snow Begins on 3,300 Miles of State Highways

By T. H. DENNIS, State Maintenance Engineer

ROAD condition inquiries vary with the season. Today, it is: "Are the roads open? Are chains necessary?" Answering in the affirmative both questions, we suddenly realize another snow removal season is under way and that, scattered throughout the State, 170 snow plows of all types have already had their initial skirmish with the enemy.

Last year, this battle was waged on a 3000-mile front at a cost of \$312,000; a similar amount will be required this season. Can we justify this expenditure, which requires approximately 17½ cents from the gas tax return made by each of the 1,800,000 motor vehicles in California? Let us determine.

Snow is removed on 29 State Highway routes, which serve in the aggregate some 11,226 vehicles daily during the winter months. Assuming each machine traveled 150 miles, making 14.5 miles to the gallon of gasoline—averages determined in the joint survey conducted by the United States Bureau of Public Roads and the Division of Highways—then the daily return from gas tax would be \$3,486 or \$313,740 for a conservative winter season of three months' duration.

OPEN ROADS PAY

Apparently, therefore, the motorists enjoying this service on these particular routes pay their way. Furthermore, if these roads were closed for a three months' period, the interest loss at 4 per cent on some 3000 miles of road, conservatively estimated to cost \$15,000 per mile, would amount to \$450,000. Considered from this angle, also, it would appear advisable to keep these routes open.

Let us consider the situation from the standpoint of business. The State Chamber of Commerce is authority for the statement that some \$1,500,000 was expended by motorists during the 1931-32 season for transportation alone to winter sports areas, and that this same figure for last year was nearer \$2,000,000. The expenditures for snow sports wearing apparel and equipment, together with the sums spent for meals and lodgings, might conservatively equal, if not exceed, this cost of transportation.

Even assuming the year's expenditure with business at \$3,000,000, then a 10 per cent profit on this amount would almost equal the sum invested to make this development possible. Therefore, snow removal from the standpoint of traffic and business interests is economically sound, and its development will continue.

MILEAGE INCREASED

During the past winter season, snow was removed on 3000 miles of State highways. It is planned to continue the work on the same sections this year and also include the mileage of the new secondary roads where the public was formerly given this service by county forces. This will increase the mileage some 300 miles.

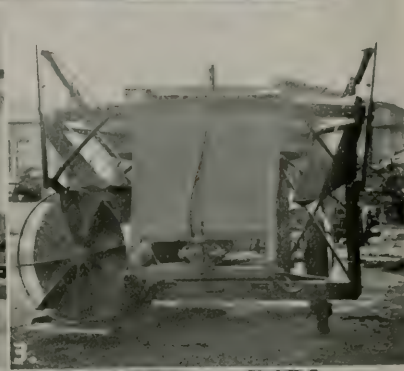
This work carries with it a very definite responsibility for the proper protection of traffic. It is the view of those in charge that, if an open road is advertised, it must be as safe as conditions will permit. With this in mind, arrangements are made for the placing of hazardous sections of road under control. This phase of the work is handled in cooperation with the California Highway Patrol.

Whenever there are icy conditions, motorists are not permitted to enter the control area unless the vehicles are equipped with skid chains. Likewise, during periods when snow is falling heavily or there is a strong wind with consequent low visibility and danger of temporary blockade, traffic is held up entirely until conditions are favorable for safe passage.

This control is a part of the routine work on the Donner Summit section of U. S. 40, and between Bishop and the State line on State Route 23. Controls are placed in operation at other points as the need arises.

PARKING SPACE ESSENTIAL

One of the gravest problems in recreational areas where snow sports are held is the lack of parking space. As a result, when sudden storms occur, our snow equipment is often blocked by locked cars parked along the roadway. This condition might easily jeopardize the safety of all motorists using this



4.

SNOW-FIGHTING EQUIPMENT already skirmishing on the 1933 battlefront. No. 1—Team work last winter with big auger blower plow following truck equipped with slice bar. No. 2—One of the auger blowers. No. 3—A widening rotary on semitrailer. No. 4—Big Blade rotary ready for action.

Laboratory Tests Determine Relative Efficiency of Reflector Sign Buttons

By T. E. STANTON, Materials and Research Engineer

THE Materials and Research Department of the California Division of Highways has recently completed an investigation of the use of the photo electric cell for testing the relative efficiency of various types of directional and warning sign reflector buttons.

Field tests are difficult because (1) tests made in the open require a secluded location free from extraneous light sources such as automobile headlights, street lights, etc.; (2) such tests can be conducted only at night and in element weather; (3) considerable labor and expense are involved in setting up and conducting the tests; (4) the human eye is quickly fatigued and not reliable; and (5) camera records used to supplement the eye test fail in that the sensitivity of the film to various parts of the spectrum band is not comparable to that of the eye.

It was, therefore, decided to investigate the use of the photo electric cell for the purpose.

THE PHOTO ELECTRIC CELL

Photo electric cells are light sensitive devices with an extremely high electric resistance in the dark which decreases as light falls on the cell, thereby permitting the passage of currents of varying intensity. This current can be amplified and accurately measured.

The sensitivity of a photo electric cell is many times that of the human eye; corresponds exactly in proportion to the light intensity; is not subject to fatigue; and is not affected by normal changes in temperature—in short, it is an ideal device for measuring the intensity of light.

APPARATUS

A light-tight box (Fig. 1), about six feet long, was built in one end of which was mounted the photo electric cell placed behind an adjustable shutter. The light beam enters through a hole in the end of the box—the center of the hole and center of the cell shutter being in the same horizontal plane.

Near the opposite end of the box is the support and holder for the reflector button. This unit consists of a plate mounted on a

support having a vertical adjustment. The support is carried on a "U" shaped trunnion that allows the plate to be rotated without raising or lowering the center of the button. A pointer attached to the trunnion shaft is placed outside the box to indicate the angle between the reflecting button and the beam of light.

LIGHT BEAM CONCENTRATED

A balopticon equipped with special lenses provides the source of light. The projecting lens is placed close to the hole in the dark box. To concentrate the light and to minimize extraneous reflection a plate, in the center of which is cut a small square hole, is inserted in the slide carriage, thereby defining a 2-inch square illuminated area on the button holder at the far end of the box.

The path of the light beam, the center of the photo electric cell shutter and the center of the button plate are all in the same horizontal plane.

Variations in the current through the cell are on the order of billionths of an ampere—much too small to be directly measured. Consequently, an extremely sensitive vacuum tube amplifier is used to boost the current 10,000 times when it is read on a micro-ammeter (an instrument reading to millionths of an ampere).

Figure 1 is a cross-section of the complete set-up.

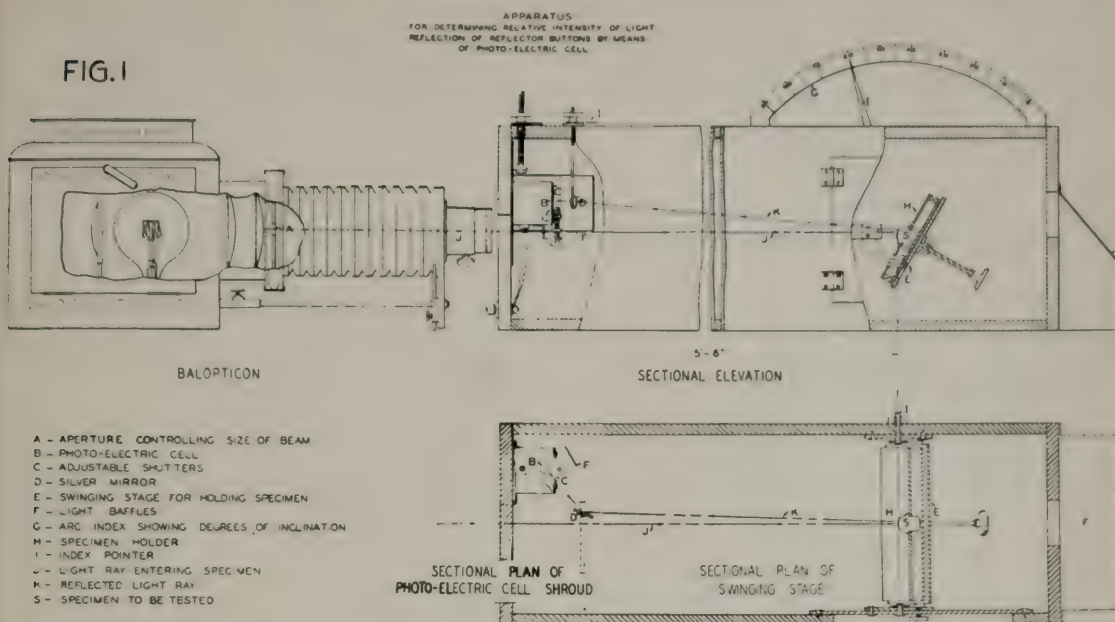
PROCEDURE OF TEST

With the empty button holder in place the light is turned on and the amount of extraneous reflection recorded.

The button is then inserted and the trunnion set so that the face of the button is normal to the light beam. This reading is recorded as that of an angle of incidence of 0°. The trunnion is then rotated from the normal in steps of 5° with a reading recorded at each step.

Due to the low cost at which these buttons must be manufactured, it is not to be expected that the lenses will be absolutely true. A very appreciable variation is found in the light intensity of the same button when it is rotated about an axis perpendicular to the center of the lens.

FIG. 1



In placing the buttons in road signs there is no way of predetermining when the button is placed to its best advantage, therefore, any rating to be truly representative of the efficiency of a particular type of button must consist of the average single measurements on a large number of buttons or of several readings on each of a relatively few number of buttons at different positions.

FOUR READINGS TAKEN

Whenever initial tests show a particular type of button to be of such quality as to merit further consideration, four sets of readings are taken on each of not less than three buttons. When one set of readings is completed, the button is rotated 90° (in the plane of the face of the holder) and another set of

readings at varying angles of incidence recorded.

Readings are taken at each of the quarter points in the circumference of the button. The button is rated on the average of the readings taken in the four positions; the average for the three buttons being taken as the relative value of the buttons of that particular size and make.

The scale of the meter, 0° to 200°, is increased when necessary by a shunt giving a range from 0° to 400°. All readings beyond 400 are designated at 400+, and no effort is made to determine a top limit beyond 400.

SOME MARKED VARIATIONS

Figure 2 lists the comparative reflection of some of the reflector buttons tested. It will

Fig. 2 COMPARATIVE REFLECTION OF VARIOUS REFLECTOR BUTTONS

Ang. of Inc.	TYPE							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	7/8"	1"	1-1/4"	1"	1"	1"	1-1/8"	7/8"
0°	194	153	372	282	221	111	96	55
5	117	141	377	246	196	95	102	40
10	65	130	385	219	211	110	106	39
15	41	98	385	83	247	95	97	33
20	14	53	329	67	320	140	113	36
25	5	9	284	89	362	142	106	51
30	14	9	9	126	343	160	94	122
35				153	4	100	106	273

(Continued on page 16)

\$13,903,124 of Contracts Awarded

(Continued from page 1)

These "**Forgotten Men**" have been chosen by committees in the various localities in which they live. Their selection was made by the mayor of the town, the commander of the American Legion, and one prominent business man. And, in passing, I extend my sincere thanks to these committees for the promptness and effectiveness and dispatch with which they have cooperated with the department in relieving distress. It is our hope that our fund may last so that this employment shall not terminate before the end of May, 1934.

"The Forgotten Man."

Eyebrows were raised in August when I announced that the program of this department had been ordered speeded up by Governor Rolph so as to put the maximum number of men to work in a minimum space of time. Those eyebrows raised because Governor Rolph urged advertising and letting of \$20,000,000 worth of highway construction by Christmas. He told us that the greatest thing we could do for the State was to put the honest citizen back to profitable labor.

"FIFTY THOUSAND MEN" SLOGAN

Double shifts, night and day work, became the order of the department and in the middle of August our great highway building program was launched.

"Fifty thousand men at work by Christmas."

That became the slogan of the department.

I am happy now to announce that that slogan was no idle cry. At the date of this writing, December 8th, \$13,903,124 worth of contracts have been advertised and awarded. Barring additional unforeseen circumstances, such as the suit brought against us which holds up a \$200,000 contract pending a test of the legality of a recent act of the Legislature our \$20,000,000 program will be an accomplished fact around Christmas.

Under Federal and State provisions, employment on the majority of this work goes to men with families in the neighborhood of the project.

"The Forgotten Man."

A distinct change for the better in the employment situation in California seems at hand. But are we not overlooking another grave problem in employment? What is being done for the single man without dependents? Is he not really:

"The Forgotten Man?"

The youth who graduated from high school or college in the last two or three years and who would, under more prosperous conditions in the nation; immediately go to work, finds that he is not wanted. Every employer today is concerned with placing on the pay roll men of families.

To me the idleness of the young men of the State and Nation is a grave problem. I feel that bitterness, radicalism and communism are bred of this condition.

Is it not the fact that the youth of today filled with the theoretical point of life but none of the practical; forced into idleness by an economic condition over which he has no control, and denied the privilege of earning his own money is

"The Forgotten Man?"

TRUCK TRANSPORTATION SURVEY

In an effort to determine the existing relationship of motor trucking to freight transportation and the sphere in which the transportation of goods by motor vehicle is more economical or serviceable than by other means of transportation, the Federal Coordinator of Transportation on September 13 started a nation-wide survey among motor truck fleet operators, according to an announcement by Joseph B. Eastman, Coordinator.

About 16,000 operators of motor truck fleets throughout the country, including franchise and contract carriers for public hire, and also those private operators of ten or more vehicles who handle their own goods in their own or rented vehicles, are included.

"I've just got rid of my saxophone in part exchange for a new car."

"I didn't think they accepted things like that for a car."

"Well, this case was an exception. The dealer happened to be our next-door neighbor."

—Vancouver Province.

Schoolboy (home for summer holidays): "Well, dad, I bought some books on farming for you to dig into."

Father: "And I've bought another thirty acres for you to dig into."—*Exhaust.*

Gasoline Tax Shows \$4,000,000 State Loss in Biennial Revenue

By **E. R. HIGGINS**, Comptroller
Department of Public Works

THE October gasoline tax assessments recently announced by the State Board of Equalization amounted to \$3,182,008, a decrease of 3.59% from the October, 1932, assessments, and 5.71% from the October, 1931, assessments. Total assessments for the year 1933 to and including October have amounted to \$32,528,898 as compared with \$34,090,814, and \$35,241,596 for the corresponding periods of 1932, and 1931 respectively. In terms of percentage these decreases amounted to 4.58% and 7.70%.

While the rate of decrease on a percentage basis may not seem large, when expressed in terms of dollars the biennial loss to counties is approximately \$2,000,000, and the loss to the State Division of Highways about \$4,000,000. In view of the fact that maintenance and administration expenditures are more or less in the nature of fixed charges, the decrease of \$4,000,000 in the amount of funds available to the Division of Highways necessitates a direct reduction in the construction program to that extent.

DIMINISHING ELSEWHERE

That the gasoline tax as a source of highway revenue may have reached the point of diminishing returns is indicated by the fact that receipts in other States have also fallen off materially. Information is not available from all of the States for 1933. However, in 1932 the total gasoline tax collected in the 48 States and the District of Columbia amounted to \$513,000,000 compared with \$536,000,000 for 1931, a decrease of 4.3%. On the basis of partial returns receipts for 1933 will show a further decrease from 1932 of 4 to 5% or a decrease from 1931 of about 8%.

Diminishing returns may be solely a direct result of depressed business conditions or they may indicate that motorists are restricting their use of motor fuel in order to save gasoline tax costs. If the latter is the case then gasoline taxes have been imposed to the point where further increases in basic rates will provide no increase, in fact may even result in a decrease in revenue. It is quite likely that this point has been reached in some States where the rates are high.

PROGRESS—A VALEDICTORY

Before the advent of the Bayshore Highway, Mrs. Marguerite Flagg Anderson of San Mateo lived on a quiet, unpaved street. To accommodate the great four-lane highway on its route through the little street it was necessary to acquire a considerable portion of Mrs. Anderson's front yard, and the following poem is her valedictory to the graduation of her home into the big, busy world of modern progress.

OH, for tranquillity—peace as of yore!
Just for a day of that rest and content
When never a boulevard passed my door
Nor traffic noises my faculties spent.
Where is the cypress hedge, arched for a gate—
My colorful garden, gay in the sun?
Adieu to them all; they met the same fate:
Tractors and plows over sentiment won!
Must I now harbor resentment at heart—
Want back my flowers so tenderly sown?
Should even a home or treasures of art,
Time's mighty March of the Ages postpone?
PROGRESS: I'll fashion my life to the mode—
Concede to Advancement, my Country Road.

—MARGUERITE FLAGG ANDERSON.

New Pavement for Valley Boulevard Link

In San Bernardino County 3.5 miles of the El Centro-Los Angeles highway is to be graded and paved from Sierra Avenue to Riverside Avenue on Colton Avenue between the towns of Ontario and Colton.

The new pavement will be 20 feet wide with 8-foot shoulders and will connect at its westerly end with the new pavement which was completed in June of this year between Vineyard Avenue and Sierra Avenue.

This route is one of the important State highways which lead easterly from the metropolitan Los Angeles district and as such it carries a large volume of commercial trucking and transcontinental traffic.

Traffic Policeman: "Miss, you were doing sixty miles an hour!"

She: "Oh, isn't that splendid! I only learned to drive yesterday."

It is unlikely that such a point has been reached in California, and undoubtedly with the restoration of normal business conditions the gasoline tax at present rates will produce more revenue than it has at any time in the past.

Tragedy Springs, Where Pioneers Were Murdered, to be Beautified by State

By A. I. RIVETT, Assistant to Maintenance Engineer

TRAGEDY SPRINGS! Even the name conjures vivid and stirring pioneer pictures depicting the tragic events of the days of our forefathers. Today, however, only silence and calm and a carved marker reveal the location of this historic old waterhole.

Sixty-two miles east of Jackson, just west of Silver Lake, on the old Kit Carson trail, now known as the Alpine Highway, Tragedy Springs still give forth their cooling waters for the refreshment of today's passers-by, but not a murmur of the stirring events of long ago in which they figured.

In the month of June, 1848, Daniel Browett, Edgar H. Allen and Henderson Cox, three hardy pioneers, drove a large herd of cattle down over the Kit Carson trail to market and, having disposed of their stock and received payment therefor, they came on the evening of the twenty-seventh, on their return journey, to a pure cool spring just off the trail.

MURDERED IN NIGHT

Here they camped for the night. But the night, instead of bringing quiet and peaceful rest, brought bloodshed and death. Tradition long held that the three had been murdered as they slept and their bodies burned by a band of roving Indians. However, tradition often bears close scrutiny and examination, and it has since been proved that renegade whites who knew of the trip of these cattle men to market lay in ambush for them and murdered them for their money, endeavoring at the same time to throw suspicion upon the Indians of the locality.

So today near Tragedy Springs, as they were named in memory of Browett, Allen and Cox, a mound of loose stone on the slightly sloping hillside marks the last resting place, the common grave, of these three pioneers.

To record this event, not long after that tragic date in 1848, the names of Browett, Allen and Cox and the date of the murder were carved into a massive fir tree, near the grave.

Storms and time weakened the old tree, however, and in the winter of 1930-31 it

was blown over, breaking off some eight feet above the ground, but leaving intact the carved inscription upon its stump.

MARKED BY PLAQUE

In 1931, 83 years after the crime, a heavy slab bearing the ancient carving was taken from the old stump and removed to Sutter's Fort in Sacramento, where it now rests in the fort museum. That the location might not lose its identity the Native Sons and Daughters of Amador County caused a replica in bronze of this old marker to be prepared, and on August 30, 1931, dedicated it to the memory of the murder victims. This plaque, imbedded in a great granite rock near the scene reads:

To the Memory
of
Daniel Browett,
Edgar H. Allen
and
Henderson Cox

who were supposed to have
been murdered by Indians on
the night of the 27th of June, 1848

Following a pilgrimage by a caravan of the Odd Fellows Lodges of Amador County in August, 1929, to the Kit Carson monument which marks the summit of the old trail, during which pilgrimage the caravan rested at Tragedy Springs, a request was made to the Director of Public Works that the State develop a resting place at this historic point and preserve the memory and atmosphere of the event of yesteryear for the passersby of today.

STATE PLANS FOUNTAIN

As a result of this suggestion, the Department of Public Works, through the Division of Highways, recently signed an agreement with M. and George Bachich, present owners of the spring, who because of their fine public spirit and interest granted the use of a portion of the spring waters to supply a drinking fountain to be erected by the State in the center of a beautified location marking the spot.

That Tragedy Springs early became a



THE PIONEERS' GRAVE at Tragedy Springs on the old Kit Carson Trail is shown by the mound of stones under which were buried Daniel Browett, Henderson Cox and Edgar H. Allen, murdered in their night camp June 27, 1848. The carved record of the tragedy made in the tree of which the trunk remains was removed for preservation in Sutter's Fort Museum. Seepage from the historic springs is seen in right foreground.



MARKING THE SPOT, a bronze plaque bearing names, date, etc., was set in big boulder near the springs and grave by the Native Sons and Daughters of Amador County.

resting place for caravans and travelers was shown by a discovery made on August 26, 1901, by Nick J. Ferrari, a former owner, who on that date filed a water claim on these waters.

DISCOVERED OLD BLAZE

While visiting the spot one day Ferrari observed a tree, a short distance west of the spring along the old emigrant trail, which carried a slight scar. He cleared away the bark and revealed the following inscription:

AUG XIX 1848
2ND CO
J. J. WRIGHT

Mr. Ferrari states that Wright led the second party of emigrants that traveled the

old trail. Other tell-tale marks indicate the old route. Grooves on the rocks where many wagon tires passed still show. Blazed trees are yet to be found, the scars healed over.

Only a few minutes' wandering in the vicinity of Tragedy Springs will raise in the heart of today's traveler a high respect and a profound feeling of debt to those trail blazers who opened the way into the Golden State and who by their courage and hardihood left to posterity an example of grit and perseverance which every age might well emulate.

He: "But don't you cook much more for dinner than we use, darling?"

She: "Of course, silly! If I didn't, how could I economize by making left-over dishes?"

12-foot Terraces for Cuts and Fills

(Continued from page 2)

in this contract. Another large item is the overhaul of 14,000,000 station yards.

An unusual feature is the "BIG CUT" near the center of the job. This comes on the revised alignment where a ridge is crossed. Nearly one-half the entire excavation on this contract will come from this one cut, where an estimated total of 520,500 cubic yards will be moved. This cut is 2400 feet long, with a maximum depth of 130 feet.

Adjacent to this cut, on the north, is a fill 2500 feet long, reaching a height of 75 feet, which will require 605,600 cubic yards of material, to be made partly from the "Big Cut" and partly from another large cut to the north containing 217,300 cubic yards.

Due to the unusual size of these cuts and fills and uncertainty as to rock formation in the cuts, a method of terracing has been worked out. This was first suggested by Construction Engineer C. S. Pope for the fills and afterward it was decided to extend it to both cuts and fills.

In the large cuts exceeding 30 feet in depth it is our plan to open up on pioneer slopes of $\frac{1}{2}$:1 before determining the final slopes to be used. If the bedding planes of the rock stratification are very nearly horizontal, we will grade the section as shown on the typical cross section, with a 1:1 slope extending for the entire length of the cut for the upper 30 feet of cut depth; then a terrace and slopes of $\frac{3}{4}$:1 to $\frac{1}{2}$:1 will be graded, varying in approximately 30-foot depths with a terrace between each change in slope.

If the strata are tipped, the slope will be increased on the side which dips toward the roadbed, and decreased on the opposite side. We believe that this method of excavating will result in fewer slides, in addition to providing a method of removing slides should they occur.

TERRACING PLAN

We plan to make the terraces, with the exception of the top one, 12 feet in width, which is wide enough to walk a shovel to any point along the slope which might break out subsequent to excavation. The grades of the terraces along the roadway are approximately parallel with the existing ground, with a

maximum grade of 15 per cent and a 1:12 slope away from the roadway.

It is believed that this terracing will help to prevent slope erosion by collecting the water on each lift and leading it to an outlet at the end of the cut, will protect the traveling public by intercepting falling rock, and will provide a method for taking out any local slides after the excavation is completed.

On the large fills these stepped slopes consist of a series of berms six feet wide at differences in elevation of about 25 feet, the fill side slopes to be $1\frac{1}{2}$:1. The berms will slope toward the roadway at 1:12. It is believed that this terracing of the big fills will reduce slope erosion and give greater stability in the foundation of these deep fills.

The work to be done under the present contract will leave the grade 1.5 feet low in cuts and in sections where soil is not too adverse. On other portions, due to very adverse soil conditions, the grade will be left 2 feet low. Satisfactory selected material will be placed over the entire section prior to paving.

We hope to get this important section paved and open to traffic early in the next biennium.

In order to make this road available for traffic a grade separation is to be built under the Southern Pacific Railroad near Cordelia, this being the only point of contact with a railroad on this cut-off. In contrast, the present route via Jameson Canyon to the Napa Y and through Vallejo has five grade crossings with various branches of the Southern Pacific Railroad. This subway and approaches will be handled under separate contract and should be under way by the time this article appears in print.

SMALL ITEM, BIG NEWS

The present work now being done by the State Highway Department at Conway Summit and in the building of snow fences, together with that being done by several contractors working on the State Highway building contracts, leaves but few unemployed men in this vicinity. Supervisors Gene G. Crosby and Robert L. Currie both reported that their cabins are filled by men who are working on these contracts.—*Bridgeport Chronicle-Union*.

Diner: "I ordered an egg sandwich and you brought me a chicken sandwich."

Waiter: "Yes, sir, I was a little late calling for your order."

U. S. Public Works Program Developed Rapidly in November

COMPLETION of 59 public works highway projects up to November 25, at a cost of \$1,301,000 was announced by the Bureau of Public Roads, U. S. Department of Agriculture, in a tabulation of highway construction. This work was completed under the Public Works Administration highway fund allotment provided for in the National Industrial Recovery Act.

Awards on 3266 projects at a cost amounting to \$165,309,000 have been made, out of a total of 4239 projects advertised for contract amounting to an estimated expenditure of \$213,551,000.

On November 25, the work advertised for contract or started by day labor employed by the highway authorities represented 50.1 per cent of the \$400,000,000 provided for highways by Public Works Administration under section 204 of the National Industrial Recovery Act.

134,805 MEN EMPLOYED

Highway work under construction by the States under section 204 was employing directly on highway work a total of 134,805 men on November 25, the Bureau of Public Roads reports. This force of men was divided between contract and day labor work as follows: 100,512 men on 1890 contract projects and 34,293 men on 533 projects on which the labor is directly employed by the highway authorities.

The estimated total cost of the work under construction on November 25 was \$129,060,000, of which \$116,525,000 was by contract and \$12,535,000 was by day labor employed directly by the highway authorities.

Awards have been made on 77 per cent of the projects approved by the district engineers of the Bureau of Public Roads, and construction is actually under way on 57 per cent of the approved projects.

SHARPS AND FLATS

Lady Friend: "Well, how do you like your new flat?"

Mrs. Newlywed: "Which do you mean—the one I married or the one I live in?"

Dentist: "You say you've never had a tooth filled, yet I find flakes of metal on my drill."

Miserable Plebe: That was my collar button."

—Annapolis Log.

HIGHWAY ENGINEERING IN 1692

"LET ME ADVISE both the greater and lesser Surveyors, to do their work substantially as far as they go. And what is now left undone, may be done another time. But a thing done slightly is good for nothing. A due thickness of Stones and Gravel, may (with a little reparation) last forever: whereas too small a Quantity will soon be swallowed up in the Dirt, and no sign left of it. Moreover where the Ground is false, and rotten, and of the nature of a Quagmire; all the cost of labour bestowed upon it is merely lost, unless you lay faggots or bavins of Brush wood, across and under the made Way. And in this and all other sorts of ground, it must be a principal care to lay the Wayes dry: so that no water may run along them or over them, or ly upon them . . ."

As quoted from "A Proposal for Maintaining and Repairing the Highways": E. Littleton, in the new book on old engineering entitled: "The Early Years of Modern Civil Engineering."

Great Fill and Wall for Bridge Approach

One of the largest projects to be undertaken by the State in some time is the construction of the dredger fill and placing of a rock wall for the East Bay approach to the San Francisco-Oakland Bay Bridge. This project involves the removal of nearly a million cubic yards of mud and the placing of over three and one-half million cubic yards of dredger sand fill along the northerly side of the Key Mole fill and the westerly waterfront of Emeryville as far as Ashby Avenue in Berkeley. The fill will be protected with a face of 348,000 tons of rock.

Another important East Bay improvement being made by the State is the paving of the central portion of San Pablo Avenue in Berkeley, Albany and El Cerrito, where the car tracks are now being removed. This improvement will do much to facilitate heavy traffic on this important State highway route through a metropolitan area.

GRADE SEPARATION TO BE

BUILT EAST OF DEL MONTE

Further work on the Los Angeles-Pomona lateral involves the construction of a grade separation under the main line tracks of the Southern Pacific Railroad $1\frac{1}{2}$ miles east of El Monte.

The State will place the concrete abutments and the steel girders which will carry the tracks will be placed by the railroad.

New pavement is nearing completion on this route between El Monte and Covina.

Adequate Program for Highways to be Topic of Convention

HIGHWAYS are leading the Public Works Program for National Recovery. This fact will have an important bearing on the coming convention of the American Road Builders' Association which will be held in Chicago, during the week of January 22, 1934. In connection with the convention the Association will hold a comprehensive exhibit of highway equipment and materials.

In announcing the convention date and location, H. C. Whitehurst, engineer of highways of the District of Columbia and president of the American Road Builders' Association, emphasized the four major subjects that will engage the attention of the convention. They are:

TOPICS FOR DISCUSSION

"The Need for Continuation of an Adequate Highway Program.

The Necessity for Federal Participation in the Nation's Road Program.

The Use of Highway Revenues for the Extension and Improvement of the Nation's Highway Network.

The Necessity for Bringing Back to the Highway Program Gasoline and Motor License Revenues which, During the Period of Economic Stress, Have Been Diverted to Other Purposes."

Mr. Whitehurst pointed out the necessity of coordinated action to stop the inroads upon highway funds. "Unless checked," he said, "the diversion of gasoline taxes and motor vehicle license fees to other than highway purposes constitutes a serious threat to a continued highway program.

FALLEN BELOW NEEDS

These diversion tendencies must be dealt with in a positive manner; otherwise the entire highway program may collapse. This must not occur, as the highway program plays too important a part in our national life today."

The Nation's highway development in the past three years—in spite of the \$400,000,000 emergency public works road program—has fallen below a standard that gives reasonable assurance of meeting the needs of motor transportation.

Customer: "Did I leave an umbrella here yesterday?"

Grocer: "What kind of umbrella?"

Customer: "Oh, any kind, I'm not fussy."

Huge Monolith Rises from Bay Waters to Bear Bridge Tower

ONE concrete pier completed, 11 others in construction, and the approach to the Yerba Buena Island tunnel virtually completed—this is the status of the San Francisco-Oakland Bay Bridge, which was placed in construction July 9 by the State Department of Public Works.

Aside from the fact that 2100 Bay Region men are at work on the bridge to provide a livelihood for 3000 dependents, this \$75,000,000 bridge is making itself felt as a real entity in the San Francisco-Oakland Bay Bridge metropolitan area.

The progress of the bridge is visible daily to thousands of commuters in its various phases of construction.

CONCRETE MONOLITH COMPLETED

On historic Rincon Hill, San Francisco, 20 per cent of the concrete cable anchorage has been completed by Healy-Tibbitts Construction Company, contractors.

At the end of Harbor Dock No. 24, at the foot of Harrison Street, Bridge Pier No. 2, a concrete monolith rising to the height of a 7-story building from bedrock to a point 40 feet above the water line, has been completed ready for the steel tower which has already been partially fabricated in steel mills of the Columbia Steel Company and associates.

On Spear Street and the Embarcadero the first land pier on the western shore is now taking visible form as a stockade of steel sheet piling is being driven to form a crib into which to dump concrete.

HUGE CAISSONS IN BAY

On the bay two huge compressed air flotation caissons, like large buildings topped with many domes, float on the water between San Francisco and Yerba Buena Island as they are slowly weighted down to bedrock. These caissons are the matrices for concrete piers, and the bottom of one of them is already 95 feet below the surface of the water, and in a few weeks will have been forced 15 feet farther until its bottom rests on mud.

On Yerba Buena Island where a few months ago Governor James Rolph, Jr., Ex-President Hoover, State Director of Public Works Earl Lee Kelly, Chief Engineer C. H. Purcell, and other distinguished citizens broke ground on



DOMES OF STEEL forming the tops of the 55 cylinders in the world's largest compressed air flotation caisson for the concrete center anchorage of the San Francisco-Oakland Bay Bridge are shown in the above photograph revealing San Francisco's skyline in the background as the caisson is being sunk in mid-bay. The domes are alternately cut off and rewelded into place as the cylinders are increased in height. The caisson is 92 feet wide by 197 feet long and the anchorage when completed will be 478½ feet high and project 298½ feet above water.



UP FROM THE DEPTHS of the bay off the end of San Francisco's Harbor Dock No. 24 a mass of solid concrete the size of a 7-story building has been constructed from bedrock to a height of 40 feet above water. It constitutes Bridge Pier No. 2 and is all ready for the great steel tower that will be erected upon it.

July 9th last, the approach has been cut through on the west side to a point where tunnel operations will soon begin.

On the east side of the island, on Army Point, where President Roosevelt set off the first blast of the bridge, a steam shovel has excavated tons of earth for the most westerly pier of the world's third largest cantilever span to be erected here.

East of the island in two false bottom caissons, concrete has been built up to more than 100 feet from the bottom to their tops above water.

Four other piers of the steel sheet piling cofferdam-construction type are well under way, and some are nearing completion just north of the Key Route Mole where the bridge ends and a fill will begin.

Defects Found in Reflector Buttons

(Continued from page 7)

be noted that some of the buttons lose visibility very rapidly beyond an angle of incidence of 30° ; the $\frac{1}{2}$ " and 1" size of one button falling off rapidly from the start; whereas, in the case of four of the buttons the intensity is greater at an angle of incidence of 25° to 35° than the intensity of reflection in a normal position.

Figure 3 shows a cross-section of two standard type buttons.

Construction of Buttons

Reflector buttons differ widely in their characteristics, therefore a short description may be of interest.

The ones included in the test may be classified in one of two general types:

- 1—Those in which the reflector and lens are separate and held in proper relation by a metal housing.
- 2—Those in which the reflecting medium is applied to the rear surface of the lens by plating.

The latter method, for a uniform and durable product, involves a precision process which does not appear economically practicable in connection with the manufacture of a unit which must sell for 7 cents or less. If the plating is not well done, the expansion and contraction of the glass, caused by temperature changes, will loosen the reflecting plating and seriously impair the efficiency of the reflector button.

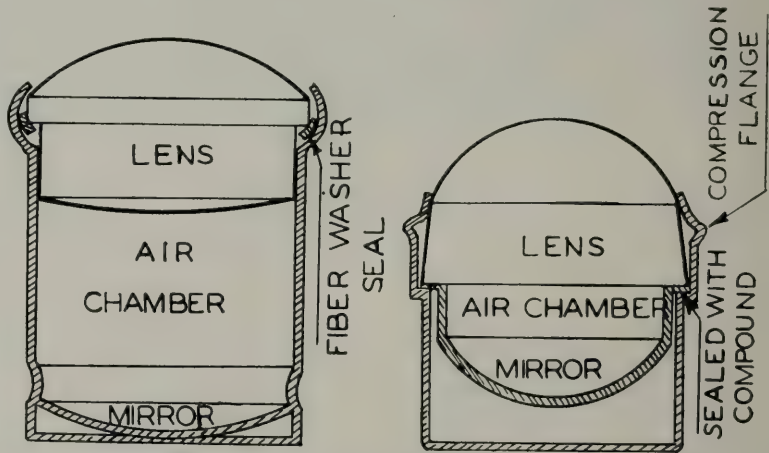
IMPORTANCE OF SEALING

With buttons of the first type, the mirror (of metal) is plated with either silver or chromium. Silver has a reflecting efficiency of 95 per cent as against 70 per cent for chromium, but silver, unless hermetically sealed, tarnishes more quickly than chromium.

The question of sealing is very important, not only to prevent tarnishing of the reflec-

tor surface but to keep out moisture which, entering with the warm air, precipitates, thereby fogging the reflector and rendering it almost useless.

In one type of button sealing is attained by a fiber or rubber washer under the lens. This washer may in time, if not very accurately and substantially constructed, oxidize and permit the air and moisture to enter the large



CROSS SECTION OF TWO
STANDARD TYPE BUTTONS

FIG. 3

chamber between the lens and the reflector, destroying the usefulness of the button.

LARGE LIFE INDICATED

In another type, the sealing media is a compound which resists oxidization and remains tacky at all normal atmospheric temperatures. The air chamber between the lens and reflector is very small and the reflector is so shaped and placed that it makes direct contact (through the sealing media) with the lens. There is a possibility that the useful life of this type of button will be materially greater than that of the first one described.

A comparison of the lenses in the different buttons indicates better workmanship in some than in others. This is to be expected as in some cases the buttons are manufactured by

(Continued on page 22)

Highway Funds For States in 1934 Will Total \$644,450,000

WHILE States are assuming increased financial responsibility for a larger mileage of highway construction and maintenance, the past year showed a decided slump in the funds furnished the State road departments for this work, and the amounts for 1933 and 1934 will again decline, W. C. Markham, Executive Secretary of the American Association of State Highway Officials pointed out in his report at its annual meeting held recently in Milwaukee.

It is estimated that the total State funds for this year will reach little over \$485,725,000 and for next year about \$448,700,000.

FIFTY PER CENT LESS

Adding to this all remaining portions of regular Federal aid and emergency Federal funds, plus one-half of the \$400,000,000 Federal funds available under the NRA, the total available to States for roads in 1933 is put at \$721,400,000. Next year's total for highway purposes is placed at slightly more than \$644,450,000—almost 50 per cent decrease in funds in about two years.

Mr. Markham noted with disapproval the tendency of State Legislatures to divert highway funds to other purposes, mostly for unemployment relief. More than \$200,000,000 of motor license fees and gasoline tax receipts have been thus far transferred this year, Mr. Markham said.

APPROVED BY CONGRESS

"The very fact that Congress in passing the Recovery Act provided \$400,000,000 to be spent on highways is clear evidence that it recognized road work as a quick and economic method of aiding the unemployed," he added. "Yet protestors have declared in and out of legislative halls that we are overbuilt in dependable highways and had better use our public funds in other directions."

The total mileage on the State road systems in this country is now about 373,000,000 miles—almost 21,000 miles having been added during the past calendar year. The surfaced mileage on this system was increased almost 23,000 miles during this time. Thus, according to Mr. Markham, the surfaced mileage has hardly more than kept pace with the mileage added to the systems. About 25 per cent is still unimproved.

\$253,850,000 SHRINKAGE OF HIGHWAY FUNDS FOR STATES IN PERIOD OF TWO YEARS

Total highway funds available to the States from all sources, including Federal aid in 1933.....	\$721,400,000
Total funds available in 1934.....	644,450,000
Decrease for 1934.....	\$76,950,000
Total funds from States' sources available for highway purposes in 1933	\$485,725,000
Total State funds for 1934.....	448,700,000
Decrease for 1934.....	\$37,025,000
Total available funds for State highway departments in 1931.....	\$898,317,794
Decrease in two years of nearly 50 per cent.....	\$253,850,000

COLOR SCHEMES ADOPTED FOR 1934 LICENSE PLATES

Color schemes of 1934 licenses will change in 34 States. California plates will be black on orange, the reverse of 1933. The only other change in the 1934 plates will be the name "California" across the top instead of the bottom.

Issuance of 1934 California numbers will start Tuesday, January 2, at offices of the Division of Motor Vehicles, and to out-of-State motorists and members, through automobile clubs.

Survey of 1934 plate colors discloses that California and 13 other States and the District of Columbia will retain 1933 color schemes, reversing them as to background and lettering.

White on black will be used in six States, Florida, Minnesota, Mississippi, Missouri, Rhode Island, and Virginia. Black on yellow will be used in Idaho, Michigan, Oklahoma, West Virginia, and District of Columbia. Black on orange, yellow on black, and white on blue will each be used in four States. Beyond these standard colors will be a wide variety of hues, such as old gold on blue in Delaware; yellow on blue in Iowa; black on aluminum in Utah; green on white in Washington and white on wine in Wyoming.

Alaska will use plates with white letters and numerals on a green background. The Canal Zone will use white on blue, as will Hawaii. The Philippines will have white on apple green and Porto Rico yellow on black.

Road building produced nearly 10 per cent of the railroads' entire tonnage in 1932. *Public Roads* points out that, in addition to materials such as sand, gravel, broken stone, slag, cement and steel, construction equipment bulks large, the combined tonnage furnishing the carriers 60,000,000 tons of revenue freight annually.

Girl (to tiresome suitor at 3 a.m.)—I think I'll name my car after you.

Suitor—Thanks for the compliment; it's a swell-looking car.

Girl—Yes, but it's so difficult to get it going in the morning.

CALIFORNIA HIGHWAYS AND PUBLIC WORKS

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EXTENDING OUR SUBURBS

The completion of the new Ridge Alternate Highway cutting the old road from Los Angeles to the San Joaquin Valley nine miles in distance and an hour in time, forms



a link between these points of far greater importance and value to southern California even than appears at first sight. It will, of course, prove itself a great convenience to the motorist

traveling for pleasure or making a quick business trip, and such light traffic will undoubtedly form its most prominent feature. But from the practical transportation standpoint it fills a more general need than this.

Though not so immediately apparent the new Ridge Highway will confer a marked benefit on land in the lower San Joaquin Valley, since the worth of agricultural lands depends to a considerable extent on their proximity to metropolitan markets. Putting it briefly, it brings these lands closer to Los Angeles and thereby adds suburban advantages to an agricultural area. This shorter and easier route has brought the lower San Joaquin Valley as close, in point of time, to Los Angeles as were lands only fifteen miles out in the dirt-road and horse-and-wagon days. The value of the valley lands is correspondingly and proportionately enhanced.

Los Angeles retailers and consumers will benefit to the same extent by the larger amount of foodstuffs that can more economically be brought to market here through the facilities afforded by this new trade artery—and that will prove the most useful purpose of the Ridge Alternate Highway.

—Los Angeles Times.

Road Beautification Programs Urged by MacDonald in Speech

IN HIS discussion of the highway recovery program at the recent convention of the American Association of State Highway Officials, Thomas H. MacDonald, Chief of the Bureau of Public Roads of the U. S. Department of Agriculture, spoke as follows on the importance of roadside beautification:

“There is yet another field in which a large support and assistance is available in every part of the country. This is roadside improvement, consisting largely of finishing the roadsides to heal the scars of construction operations by the addition of seeding and well designed planting. A prominent place has been given improvements of this kind in the rules issued for the conduct of the recovery highway program.

It is universally recognized that a very large percentage of the total use made of the highways is for recreational and social pursuits. Reasonable expenditures for providing pleasant and beautiful roadsides are wholly consistent with sound public policy, particularly now since this type of work can be used to advantage in providing employment that reaches rather different classes than normal highway operations.

As highway executives, we will fail to realize the changed sentiment if we are longer content to build roadways only and neglect to improve and to plant the roadsides. The highway departments have been called upon to submit projects for roadside improvement on a reasonable mileage. A few miles in each State will not be considered a reasonable mileage of such work. It is hoped, with the cooperation of the States, that work of this character will be sufficiently extensive to accomplish an adequate demonstration of the tangible benefits to be derived from roadside improvement, to indicate the methods most appropriate for doing work of this character, and to establish the basis for an organization in each highway department which can carry forward continuously work of this character.

We can confidently expect that in the near future communities which have been relying upon well improved roadways to attract outside traffic, will be placing greater reliance upon beautiful highways. Already provision has been made for extensive work of this character in one or two States through the use of work relief labor.

Snow Removal Operations Described

(Continued from page 4)

particular road. It is our feeling that providing this parking space is the distinct problem of those promoting such snow sports, and their responsibility is indeed a real one.

Most of the snowfall is above the 2000-foot elevation, but an occasional freak storm descends to lower altitudes. At such times all available maintenance blade equipment must be pressed into service. A considerable portion of the mileage cleared is above the 5,000-foot elevation, and it is on these sections that difficulties are encountered and the major expense incurred.

This is particularly true on U. S. 40, between Auburn and Truckee; the Crestline Road, State Route 43, east of San Bernardino; and State Route 23, between Bishop and Bridgeport. Snow is removed on these roads at elevations in excess of 7000 feet and, due to the lack of forestation, drifting constitutes one of the main difficulties. Miles of snow fence are required, but its effectiveness is continually impaired by the vagaries of the wind currents, side-hill cuts over deep canyons being particularly bothersome.

CREWS KEPT ON DUTY

One or two light storms are expected any time after October 15, with the first heavy snowfall coming about a month later. Normally, the crews must be kept organized and all equipment held available until March 15. After that date, there will be occasional storms of short duration. Most of the equipment is then available to open up roads allowed to close over the winter.

Early in the snow removal work in California, it was realized that successful snow removal at the higher elevations depended on proper equipment, adequate shop facilities, and comfortable living quarters. Every winter season, storms of several days' duration may be expected. Equipment must be in operation practically continuously from the start of the storm until it ceases and the road is clear. Any delay on account of breakdown or insufficient equipment makes it more difficult to keep an open road.

The continuous operation in bucking snow under low temperature conditions is a severe strain on equipment, and, in order to properly service it and make necessary repairs, well heated quarters and complete shop equipment and facilities are provided in the heavy snow areas. Likewise, an eight-hour trick at the wheel of a truck plowing snow is a strain on a man, and warm, comfortable quarters, with facilities for serving hot meals at any hour of the day or night, are provided at such locations.

FOUR DONNER STATIONS

On the Donner Summit route, there are four maintenance stations which serve as headquarters: One at Colfax, from which equipment normally operates to Baxter's; one at Yuba Pass, three miles east of Emigrant Gap, which serves the section from Baxter's to about nine miles east of Yuba Pass; one at Donner Summit, which covers the section to the east of Don-

ner Lake; and one at Truckee out of which the equipment is operated east to the State line, south to Tahoe City, and this year will take care of the new secondary road to Hobart Mills. The equipment is shifted as the need develops.

The plan of operation is as follows: With the start of a storm, the one-way push plows, which are mounted on 3½ to 5-ton four-wheel drive trucks, are on the road pushing the snow into a windrow at the side of the pavement. A rotary plow is put in operation as soon as sufficient snow has been bladed to the side and the windrowed snow is thrown clear.

As the snow accumulates into a high bank alongside the roadway, it is necessary to use a slicer bar mounted on the side of a truck to slope back the bank. The snow brought in with the slicer bar is then thrown clear by the rotary equipment. At the expiration of a storm, icy sections are sanded as an added safeguard to traffic.

OPERATIONS VARIED

The plan of operation must be varied somewhat for each route as conditions are different in each locality. On the Pacific highway, the snowfall is not extreme but there is usually considerable drifting. On the Susanville lateral there is a fairly heavy fall, but much of the road is protected by timber and the drifting is limited thereby. On the road between Bishop and the State line there is a considerable mileage at about 8000-foot elevation. The snowfall is not extremely heavy but the snow is dry and, with a strong wind, the road drifts full in a few minutes.

It was found last season that on this particular route, push plows of the "V" type would serve to better advantage as they can be operated at higher speed and break through drifted snow more easily than the one-way speed plows, although they are not so effective for widening operations.

Plans are made to work the crews on an 8-hour basis, although in emergencies it is sometimes necessary to extend the day's work to 12 hours.

PLOWS OF ALL TYPES

The State now has 170 snow plows of various types with a few more in transit. These plows are of all types, from the light "V" plows on motor graders, light one-way push plows for 2-ton trucks, one-way and "V" plows for 3½- to 5-ton trucks, tractor push plows, tractor rotary plows, and truck rotary plows.

The truck rotary plows are of four types, as follows: One consists of a regular "V" type plow augmented by revolving wheel equipped with small buckets, the wheel being mounted on a movable arm, which may be moved back and forth or up and down in front of the truck at the will of the operator. On the other type, the revolving blades are on a shaft fixed to the "V" plow and simply throw the snow as the "V" pushes it to the side. This equipment may be removed and the trucks made available for other work.

The third or auger blower type consists of two long augers mounted parallel to the road surface. The revolving augers break up the snow and throw, rather than blow, it to the side through a chute. The fourth type is a large diameter wheel with several

(Continued on page 24)

Highway Replacement in U. S. Figured at 44,400 Miles Yearly

THERE are 3,040,000 miles of highways in the United States, and of that total only 868,000 miles have been improved with macadam, concrete, asphalt, oil or brick. The remaining 2,172,000 miles are still in unsurfaced dirt.

It has been the practice during the past few years under the government's federal aid policy to add approximately 15,000 miles of hard surfaced roads each year.

At that rate, with no replacements considered, it would require nearly 150 years to get the country out of the mud.

TWENTY YEARS LIFE

But the average life of the 868,000 miles now improved is only about 20 years, which means that 5 per cent, or 44,400 miles, must be replaced every year. We would be therefore, at a 15,000 mile annual rate of construction, losing 29,400 miles of improved highways every 12 months, considering the loss over a 20 year period. To be more exact, at the end of 20 years we should have lost 568,000 miles.

To make headway, then, against the huge unimproved total of 2,172,000 miles, we must build in addition to the basic program next year 44,400 miles and each year thereafter 5 per cent of the mileage which is then improved.

3,000,000 FARMS HANDICAPPED

The replacement program must go on steadily. Permanent improved highways have come to be more essential even than the railways, and their importance grows with each succeeding year. There are still 3,000,000 farms in the United States which are served only by dirt roads and are operating, therefore, against a handicap with relation to the more fortunately situated.

The highways are the people's own immediate means of transportation. They are being constructed at no cost to government, paid for in excise taxes by those who use them. There is no such thing as "overbuilding."—*Arizona Highways*.

"It's scandalous to charge us \$10 for towing the car only three or four miles," protested the motorist's wife.

"Never mind, dear," replied hubby, "he's earning it; I've got my brakes on."—*Rotary Reminder*.

New Bascule Bridge at Knights Landing Officially Dedicated

FOLLOWING formal dedicatory exercises on Saturday, December 2, participated in by State and county officials, the counties of Yolo and Sutter were linked by a splendid new bridge of the bascule type at Knights Landing, picturesque Sacramento River town, of Yolo County.

Deputy Director of Public Works Eric Cullenward, representing Governor James Rolph, Jr., severed the ribbon with the assistance of three charming young ladies who had been named to represent the community of Knights Landing and the two counties.

The bridge designed by the district engineer, Edward Von Geldern of Yuba City, was built by Contractors Rocca and Caletti of San Rafael. It represents the second unit of the Yuba City-Woodland highway to be completed by Joint Highway District No. 12. The first unit, the road between Yuba City and Robbins, was dedicated by Governor Rolph on October 24, 1931. The highway is now a part of the State secondary system.

More than 1500 people from all parts of Sacramento Valley were in attendance at the bridge rites, which were made more colorful by spectacular airplane feats, including two flights by Dan Best, Woodland aviator, under the new bridge; band concerts by the Marysville municipal band and Woodland high school band; a baseball game and the arrival by speed boat of Santa Claus cleverly impersonated by Robert G. Alderman, Secretary-manager of the Woodland Chamber of Commerce.

The program was under the auspices of the Knights Landing Lions Club, assisted by the Woodland and Sutter-Yuba Chambers of Commerce. Visiting State officials made the trip from Sacramento on Mr. Von Geldern's large motor yacht. The party included Deputy Director Eric Cullenward; John W. Howe, secretary of the California Highway Commission; District Engineer Charles H. Whitmore; Fred W. Panhorst and Stewart Mitchell, bridge engineers of the Department of Public Works; Judge Arthur Coates of Yuba City; Lloyd Hewitt, attorney for the joint highway district.

BRIDGE COST \$137,000

The Knights Landing bridge replaces as a highway unit an old, narrow railroad bridge that afforded scant accommodations for high-



CLOSING TO OPEN for traffic a new highway crossing of the Sacramento River at Knights Landing, the recently finished bascule bridge built by Joint Highway District No. 12, was caught by the camera just as the official dedication ceremony ended.



BEHIND THE BARRIER, ready to cut the ribbon and declare the bridge open to the public stands Eric Cullenward, Deputy Director of Public Works, representing Governor James Rolph, Jr., with other officials and three comely maidens chosen as queens for the festal ceremonies. In the group (left to right) are Edward Von Geldern, district engineer and designer of the bridge; Miss Sutter (Betty Saunders); Editor A. A. McMullen of Yuba City; Miss Knights Landing (Preble Berger); Eric Cullenward; Miss Yolo (Harriett Huston); Acting State Bridge Engineer F. W. Panhorst; Contractor Carlos Caletti; Secretary J. W. Howe of the California Highway Commission and Chairman W. O. Russell of the Yolo County Supervisors.

way traffic. The new span cost approximately \$137,000, while the entire improvement project, including the Sutter By-Pass causeway, cost \$900,000. Of this amount the State will

have contributed \$350,000, Sutter County \$450,000 and Yolo County \$100,000. With the exception of half of the new bridge, the whole project lies in Sutter County.

Road Tests Check with Laboratory

(Continued from page 16)

expert and experienced manufacturers of this type of equipment.

Most of the buttons examined were held in place by pressure from the rear of the sign, thereby involving some expense and difficulty in maintaining them in a proper position.

VARIOUS ANCHORING METHODS

Two of the buttons examined are pushed through from the front until a flange comes in contact with the face of the sign. This locates the button accurately. Anchoring is accomplished by means of a spring and locking retainer installed from the rear, leaving the button dependent for support solely on the metal plate of the sign.

In one of the buttons of this latter type, the locking is by a horseshoe collar which, to withstand vibration, must fit tightly, and consequently is not quickly installed. Another button of the same type has a neat arrangement, employing a slotted ring which, when turned through 90°, is forced by the spring into contact with fins projecting from the button sleeve. Locking is absolute and can be released only by compressing the spring to the point where the ring can be rotated past the fins. This type of button can be readily installed or removed.

LABORATORY TEST CHECKED

After making the laboratory tests on the different types of buttons and ascertaining that one button was apparently superior to another, a number of buttons of the apparently superior type were secured and placed in two letters of a sign close to Sacramento, replacing the buttons of the type making up the directional sign as originally constructed.

The difference in reflecting value was readily apparent to the eye, thus checking the laboratory tests.

A further study of the sign indicated that further investigation as to size, shape and space of the letters, the location of the reflector buttons therein and reflection from the face of the sign itself might be advantageously undertaken.

TESTS FOR DURABILITY

In order to determine the relative resistance of the buttons to deterioration from

weathering in the field, laboratory tests were made on a number of the buttons by placing them in a wire basket, lowering into a bath of hot water maintained at a temperature of 135°, allowing them to remain in the bath 5 minutes, or longer if any air bubbles continued to rise, removing the basket from the hot water and immediately lowering it into a bath of ice water to which a quantity of red ink had been added as a coloring media. The buttons were allowed to remain in the ice water for 5 minutes.

The hot bath expands the air within the button, and if leakage is possible, forces out a part. The immersion in the cold bath contracts the air, and the pressure without, if there is any leakage, forces the ink-colored water into the space between the glass portion of the button and the reflector back.

The buttons were then examined by holding under the surface of clear water. Any pinkish tinge resulting from leakage was readily discernible.

WHITE TRAFFIC LINE CALLED BLESSED FRIEND OF SAFETY

On one of those pitch dark, rainy nights when the headlights' brightest efforts seem feeble, when passing a truck becomes a task of careful engineering, when nervous drivers crawl along fairly hugging the center lane, then do we bless one friend of safety—that reliable, reassuring, white guide line marching steadily beside us down the highway.

And in the city—as the Chicago traffic officer at one of Jackson Boulevard's busiest intersections once said, "That white line there at the corner does pretty near as good a job as I do!"

On city street and country highway, guarding curves and corners and crossings, keeping lanes clear, expediting safe traffic flow, the pavement traffic marker does a good, efficient job of policing—*Highway Magazine*.

PROOF

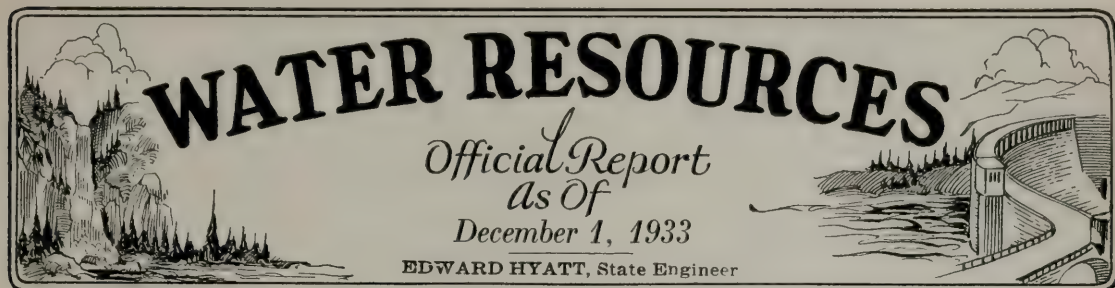
Owner of Car (to prospective purchaser): "And to show you the speed I've got out of her—here are the summonses."

SOUND YOUR J'S

Tourist: "I stopped over in San Juan and"—

Old Resident: "Pardon me, but you should say San Huan. In California we pronounce our J's like H's."

Tourist: "Well, you'll have to give me time. You see, I've been in the State only through Hune and Huly."—*Motor Land*.



Continued progress in the refinancing of irrigation districts is noted in the monthly report of State Engineer Hyatt with particular reference to the authorized refunding of \$16,190,000 of the Merced District bonds. Rights of way are being secured for units of the Federal-State program for permanent bank protection on sections of the Sacramento Flood Control Project and radio transmitters are being installed at gaging stations on the American and Yuba rivers to send flood warnings to Sacramento. Other news of the department's activities are contained in the report which follows:

IRRIGATION DISTRICTS

Petition has been filed with the supervisors of Modoc County for the organization of an irrigation district on the south fork of the Pit River. The proposed district contains about 12,000 acres lying between Likely and Alturas.

The Big Valley Irrigation District, containing 12,400 acres located in Lassen and Modoc counties, is preparing to construct a storage dam on Pit River at Allen Camp. The district, which has been inactive since its organization in 1925, expects to obtain funds from the P. W. A. for financing the work.

The Pacheco Pass Water District, in San Benito County, has prepared plans and estimates in support of an application to the P. W. A. for funds to construct a storage dam and other works on Pacheco Creek. The works to be constructed are estimated to cost about \$250,000.

The California Districts Securities Commission approved a plan submitted by resolution of the directors of the Merced Irrigation District for refunding the district's outstanding bond issues amounting to \$16,190,000.

The calling of a bond election by the directors of the West Stanislaus Irrigation District for an issue of \$250,000 in bonds was approved.

FLOOD CONTROL AND RECLAMATION

Sacramento Flood Control Project—Bank Protection.

Right of ways have been secured for the units of work to be undertaken immediately on the State-Federal cooperative program for permanent bank protection. This includes work on the Sacramento River in Districts 1500, 108, 2047 and Glenn County

Levee District No. 3. At the request of trustees, an examination was made on the left bank of the Sacramento River in Reclamation District No. 535 to determine the need for bank protection work. It was determined that the conditions along this district are not sufficiently serious to require immediate protection.

The new flood control project levee on the left bank of the Feather River from the Bear River to Starr Bend has been completed by the War Department, and in order to make use of the additional flow area provided the old river levees are to be cut in several places. A part of this work was done last season, and work is now under way at one point where the levee is being reduced in height with teams and scrapers, so that a breach will be formed at high water allowing the flood water to occupy the new channel between the old and new levees.

Pajaro River.

The work of clearing the channel of the Pajaro River, under contract with L. C. Karstedt of Watsonville has proceeded during this period, and approximately five miles of channel have been cleared to date, on three miles of which the brush has been raked and burned. The total contract covers seven miles of work.

Arrangements have been completed for the installation of radio transmitters at the gaging stations at Coloma on the south fork of the American River, at Rattlesnake Bridge on the north and middle forks of the American River near Auburn, and at Smartsville on the Yuba River for the purpose of promptly transmitting flood warnings. The receiver will be installed in the Sacramento office. This system of radio transmission of water stages has been devised and the installations are being made by Irving Ingerson, an engineer of this division.

WATER RIGHTS

Among the more important applications received to appropriate water were two by Pacheco Pass Water District of Hollister, seeking appropriations from Dos Picachos Creek and North and South Forks of Pacheco Creek tributaries of Pajaro River in San Benito County at an estimated cost of \$200,000; an application by Big Valley Irrigation District to appropriate from Pit River for the irrigation of 12,430 acres in Modoc County at an estimated cost of \$251,000; and an application by George F. Cuthbert of Los Angeles seeking to appropriate 80 cubic feet per second from the South Fork of Merced River for power purposes at an estimated cost of \$6,000.

During the month a permit was issued to Bennie Kimsey of Salyer, California, allowing 50 cubic feet per second from Spike Creek, Bee Tree Creek, Big

Season's Field Work Completed on Delta Salinity Conditions

(Continued from page 23)

Lake, Ammon Creek, White Sides and Bear Trap Creek in Humboldt County for mining purposes at an estimated cost of \$50,000.

SACRAMENTO-SAN JOAQUIN WATER SUPERVISOR

The field work on this project for the 1933 season comprising measurements of the stream flow, diversions, and return flow throughout the Sacramento-San Joaquin territory, and salinity in the delta, has been completed.

At the time of discontinuance of field work on November 1st, the Sacramento River at Sacramento was flowing about 4000 second-feet and the San Joaquin River near Vernalis about 1500 second-feet. The salinity at various upper bay and delta stations at the time the sampling at all stations was stopped, is shown in the following:

Salinity at Upper Bay and Delta Stations in Parts of Chlorine per 100,000

Station	October 30, 1933
Point Orient -----	1,760
Bullshead -----	1,220
Bay Point -----	720
O. and A. Ferry -----	600
Collinsville -----	360
Emmaton -----	162
Three Mile Slough -----	101
Rio Vista -----	7
Antioch -----	370
Central Landing -----	8
Middle River -----	11

DAMS

The usual activities, consisting of regular and continuous supervision over the maintenance and operation of the dams under jurisdiction and the inspection of repair work under way has been carried on during the month, except that in addition, during the last month it has been necessary to complete inspections on structures in the higher altitudes which will shortly be closed to travel for the winter. A review of these inspections indicates that in general the mountain dams are in satisfactory condition and should safely pass the coming run-off season. Very few repairs remain to be completed on these structures.

Said the tourist with a stricken automobile to the farmer, apparently of foreign extraction: "Say, have you got a monkey wrench?"

The farmer gaped at him.

"Naw, I got no monkey rench. My brother Nels, two mile opp de road, he got cattle rench; my brother Ole, one mile down de road, he got sheep rench, but it ban too tamm cold for monkey rench, mister!"

Snow Removal Work for 1932-33 Season Cost Stated \$312,000

(Continued from page 19)

fixed blades. The outfit is mounted on the rear of the truck, which is operated backward into the snow-drift. This plow is on the principle of railroad rotary plows.

ROTARIES ON HEAVY WORK

There is also the widening rotary, which is mounted on a trailer unit, having an independent power plant to operate the blade rotary. The rotary is mounted at the front of the trailer and can be swung in an arc to operate either side of center.

Rotary type plows are operated in areas of either heavy snowfall or where drift conditions are prevalent. The heavy "V" and push plows, straight or reversible, are usually used in conjunction with the rotaries, handling the storm until all available storage space is exhausted. The lighter push plows are operated at the lower elevations where the snowfall is light and does not pack on the ground for any long period. Where drift conditions are absent, often a light truck-mounted plow with side-wing attachment will handle snow areas where the season's fall does not exceed six feet.

SPECIAL FENCES DESIGNED

In addition to the removal work, a considerable amount of snow fence has been installed. Some of this fence is of our own design patterned after that used by railroad companies and installed permanently in place. Most of the fencing is of the lath type, however, as it is cheaper to install, easier to move, and, in the main, is more effective. In some cases, considerable experiment is necessary to determine the proper location for this fence to insure the desired protection to the roadway.

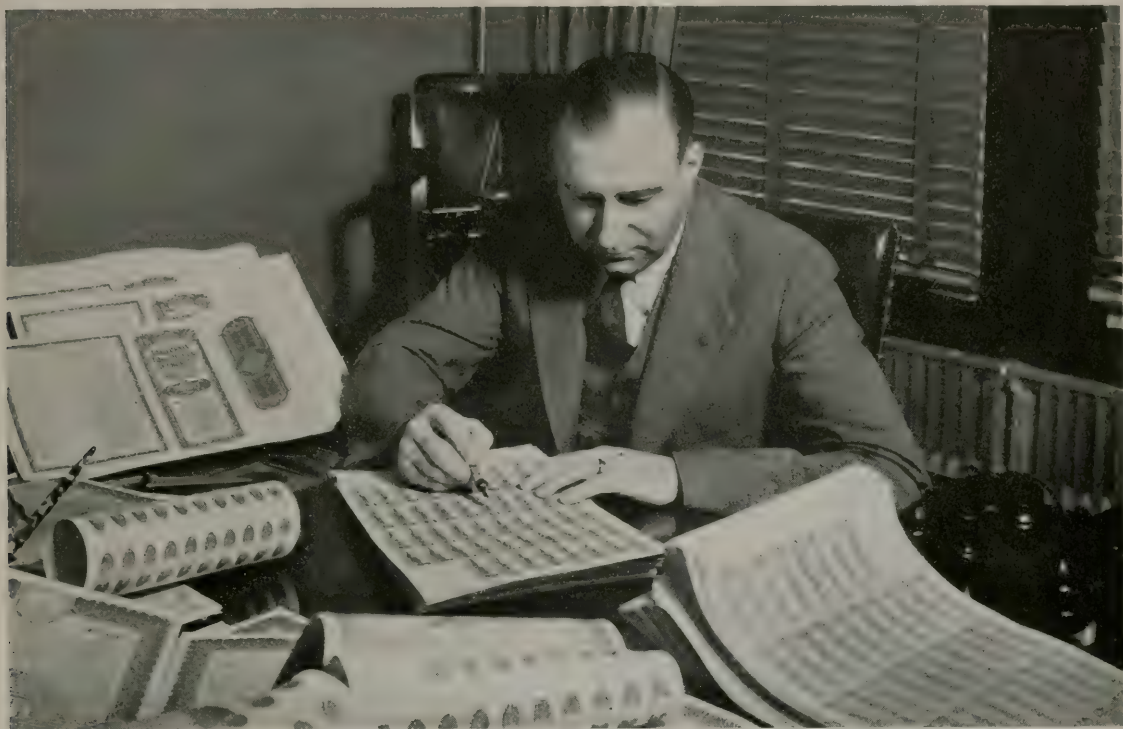
The cost of snow removal per mile of road is reduced by the use of proper equipment. It is difficult to compare one season with another exactly, as the amount of snowfall, duration of storms, wind, and similar conditions have a bearing. During the 1931-32 season, the average cost of the work on 2480 miles of road was \$124 per mile. During the 1932-33 season, the average cost per mile was \$104 on 3000 miles of road. The snowfall on these roads ranged from 48 inches to 533 inches for the season. The cost of snow removal for the entire system for the 1932-33 season was \$312,000, distributed as follows:

Materials and supplies -----	18.8%
Service and expense -----	9.0%
Salaries and wages -----	36.6%
Equipment rental -----	35.6%

The equipment is all owned by the State, but is charged to the work on the basis of a rental rate per shift or month as the case may be. This rate is established by the equipment department and covers depreciation and upkeep but no operating charges.

Snow removal presupposes that the roadway is improved so that traffic will have no difficulty once the road is open. Likewise, it is necessary, that the road alignment and surface shall be favorable for the operation of equipment.

Ray: "Where do the jellyfish get their jelly?"
Partay: "From the ocean currents, I guess."



WRIST WORK ON BAY BRIDGE—Director Earl Lee Kelly is here seen putting some real muscular effort into the job of building the San Francisco-Oakland Bay Bridge. The pile of documents surrounding him are bridge bonds, each of \$1,000 denomination. There are six thousand of them and he had to write his signature on every one. Figure the number of pen strokes and the time and energy required to complete the job.

PUTTING our "John Henry" on one \$1,000 bond would be quite an adventure for most of us.

But it is just a pain in the wrist for Earl Lee Kelly, State Director of Public Works, who is confronted with the task of putting his signature on six thousand bonds, each of a denomination of \$1,000, for the California Toll Bridge Authority, and he must achieve this signature endurance contest by the middle of December.

FUNDS FOR BRIDGE

Whenever the San Francisco-Oakland Bay Bridge Division of the Department of Public Works, of which Mr. Kelly is Director, wants more money for contractors, he is called upon to sign bonds for the necessary amount, which are then sold to the Reconstruction Finance Corporation.

In other words, no bonds signed—no money for the San Francisco-Oakland Bay Bridge, so Director Kelly in the midst of his duties, which take him from San Diego to Eureka, must trace his full name on thousands of bonds so that men can keep on working and contractors can pay their bills and the San Fran-

cisco-Oakland Bay Bridge can progress toward completion.

Ordinary signature jobs are achieved by means of a signing machine by which a man may sign as many as six signatures with one flourish of the pen.

MANUAL LABOR

The California Toll Bridge Authority bonds are not of the modest dimensions which would fit in any such machine. Whether by malice aforethought or to produce a more impressive indenture, the Authority bonds are large engraved scrolls which require individual treatment. So, the Director had to sign each one separately and it must be removed and another placed before him.

Governor Rolph, Chairman of the California Toll Bridge Authority, is considering Director Kelly's dilemma with amusement because the Governor's signature is engraved into a copper plate in facsimile and lithographed on the bonds.

Mrs. Moriarity: "I'm sorry for Mrs. O'Brien. It's tough to be left a widow with two children."

Mrs. Fogarty: "Sure, it is, Mrs. Moriarity—but she knew he was a pedestrian when she married him."

New San Gabriel River Bridge an Example of Construction Economy

By H. D. STOVER, Designing Engineer of Bridges

THE NEW San Gabriel River Bridge, very recently completed under State contract and opened to traffic, is located in Los Angeles County on State Highway No. 26, locally known as the Garvey Avenue-Holt Route, between the cities of Los Angeles and Pomona.

In a comparatively short course between the nearby mountains and the sea the San Gabriel River has developed into a broad, raging stream during flood periods with a record of widespread damage and destruction. To meet these conditions the new bridge has been given a total length of 964 feet with a 44-foot roadway flanked by 3-foot sidewalks.

A MAJOR STRUCTURE

At first observation of the accompanying photographs one would get the impression that the bridge consists of a series of comparatively short span openings and being elevated so little above the ground line, that it is a minor structure. However, due to the extreme length and the difficulties of bridging this stream, it is a major structure as far as bridges on State highways are considered. Although there is nothing spectacular in its construction, the bridge has several unusual and interesting features.

Comparative estimates indicated that a continuous concrete rigid frame structure would meet all the requirements. Fourteen 65-foot spans were chosen with 27-foot cantilever approaches at each end which rest on footings constructed on the approach fills, thus eliminating expensive end abutments. The piers are skewed at 27°.

In order to avoid complications resulting from this skew, the bridge was built in two symmetrically independent halves. No further consideration was given in the design to stresses which may be developed in a skewed concrete structure.

PIERS SUNK TWENTY-FIVE FEET

San Gabriel River is known to have scoured to a depth of 15 feet at piers of an existing bridge within half a mile of this site. Since even small settlement of piers would be disastrous for a rigid frame con-

tinuous type, these piers were carried 25 feet below the ground surface where coarse sand was encountered and test loading indicated that four tons per square foot could be safely obtained. The actual maximum calculated pressure, however, is only three tons per square foot on the foundation material. Carrying foundations to this depth below stream channel made it possible to omit the use of foundation piling.

Upon examination of the structure one will note that in its entire length there are only four expansion joints located 195 feet apart. The girders are continuous over three piers with a joint coming at the quarter point of the span. Due to the flexibility of the slender piers, which are built monolithic with the girders, the girders were considered as continuous beams.

In order to develop negative moment over the piers an inverted tee beam was provided by placing haunch slabs at the bottoms of the girders and extending 11 feet each side of the piers.

FALSEWORK DESIGNED

To prevent settlement of forms during the placing of concrete, the design of the falsework was furnished in the contract drawings, which proved to be a very satisfactory method and resulted in securing a completed job without any appreciable settlement during construction.

On account of considerable duplication in constructing spans of the same length as well as simplicity in form construction, the State secured extremely low bids on concrete in this structure, which included \$8.12 Portland cement Concrete Class "A" (footing blocks) and \$12 concrete for the remainder of the structure. These prices were undoubtedly lowered somewhat due to the extremely low prices of aggregate at the time these bids were taken.

In any event, the bid price of \$109,101 for this project resulted in securing a permanent type of structure which cost only \$2.40 per square foot of roadway surface, which is probably the cheapest bridge of this type ever constructed on the State highway. The

Bridge Has 65-foot Concrete Spans



UNUSUAL FEATURES in concrete rigid frame construction are embodied in the new San Gabriel Bridge which has only four expansion joints in its entire length of 964 feet.



PLENTY OF ROAD ROOM is afforded for heavy traffic that will use this bridge. The roadway has a clear width of 44 feet and three foot sidewalks are provided for pedestrians.



NEARBY MOUNTAINS looming in the background send down raging waters in flood periods that necessitated sinking the bridge piers to a depth of 25 feet.

bridge was designed by John Cherno of the Bridge Department, and construction was supervised by Engineer Tom Ferneau.

Salesman: "Did you like that cigar I gave you? For 500 coupons of that brand you get a banjo."

Clerk: "If I smoked 500 of those cigars, I'd need a harp."

November Contracts Total \$5,151,100 Providing Jobs for 3,765 More Men

WITH THE PASSING of November the National Recovery Program is forging ahead in California at an unslackened pace. The Department of Public Works, through the Division of Highways, set in motion State highway work amounting to \$5,151,100 between November 1st and December 1st.

This five million dollars means work for approximately 3765 men on State roads and bridges and it likewise means thousands of additional jobs in the plants furnishing materials and supplies and in the transportation companies through which such materials are shipped.

MAJOR RECOVERY FACTOR

The Division of Highways has extended every effort to advance its program of State highway work to the point of construction and each month sees additional thousands of Californians put to work on the projects included in the program. That the expenditure of these millions of State and Federal funds for construction is being felt by all industries throughout the State is fast becoming evident and the continued prosecution of the division's program will undoubtedly prove to be a major factor in economic recovery throughout California.

In the period between October 27th and November 24th, construction and maintenance work orders were issued in the sum of \$3,164,500. This sum meant jobs for many more Californians on work which had been already started or would be started within the next few days.

ONE HUNDRED TWENTY-FOUR GOING CONTRACTS

On November 23d, the Department of Public Works had 124 going contracts for highway construction in force, consisting of 94 road construction contracts and 30 contracts for the construction of bridges and grade separations.

In addition to the above, there are now published advertisements for projects estimated to cost \$2,586,300, bringing the total expenditures for work authorized, work pending and work advertised during the period from October 28th to November 24th to \$5,750,700.

These figures, added to the work put under way between August 25th and October 27th, brought the total cost of work inaugurated since the beginning of the Division of Highways construction drive to \$16,000,000.

The following tabulation sets forth the detail of the November progress in getting State highway work under way in California:

	Federal funds	State funds	Total	Men
Construction awards	\$1,293,100	\$1,394,400	\$2,687,500	1,825
Maintenance		675,000	675,000	560
Minor improvements		16,900	16,900	15
Miscellaneous projects		52,800	52,800	45
Maintenance contracts		20,400	20,400	20
Projects advertised	924,600	773,900	1,698,500	1,300
Totals	\$2,217,700	\$2,933,400	\$5,151,100	3,765

The following segregation gives the types of work and mileage of construction included in the major contract awards in the first item listed above:

CONTRACTS AWARDED

Type	Miles	Amount	No. of men
Pavement	14.0	\$719,300	600
Bituminous treated crushed gravel or stone surface	19.4	414,200	345
Graded roadbed	62.9	1,419,500	765
Shoulder treatment	36.1	77,100	65
Bridges (9)		57,400	50
Totals	132.4	\$2,687,500	1,825

The proportions of State and Federal funds are given in the following tabulation of the awards by types:

Type	Federal funds	State funds
Pavement	\$622,700	\$96,600
Bituminous treated crushed gravel or stone surface	309,400	104,800
Graded roadbed	321,400	1,098,100
Shoulders, treatment, seal coat, etc.		77,100
Bridges	39,600	17,800
Totals	\$1,293,100	\$1,394,400

Similar analysis of the projects advertised during November are made in the tabulations given below:

PROJECTS ADVERTISED

Type	Miles	Amount	No. of men
Pavement	10.8	\$699,500	585
Bituminous treated crushed gravel or stone surface	20.9	294,100	245
Crushed gravel or stone surface	0.8	33,900	30
Graded roadbed	5.4	293,500	245
Rock wall shore protection (Bay Bridge)	4.1	288,400	120
Bridges (3)		89,100	75
Totals	42.0	\$1,698,500	1,300

Supplementary to the above tabulations are given the bids opened and contracts awarded on the larger projects:

Bids and Awards for November

ALAMEDA AND CONTRA COSTA COUNTIES—Between Ashby Avenue and Potrero Avenue in Berkeley, Albany and El Cerrito, about 5 miles to be paved with asphalt concrete. District IV, Route 14, Section A. Heafey-Moore Co., Oakland, \$87,654; Southern California Roads Co., Los Angeles, \$105,404; Eaton & Smith, San Francisco, \$117,903. Contract awarded to Peninsula Paving Co., San Francisco, \$74,907.

BUTTE COUNTY—Reinforced concrete slab bridge across Pine Creek about 13 miles north of Chico consisting of six 31-ft. spans on concrete piers with steel pile foundations and concrete abutments with wing walls. District III, Route 3, Section D. E. T. Lesure, Oakland, \$18,286; M. B. McGowan, Inc., San Francisco, \$15,989; J. P. Brennan, Redding, \$15,122; Neves & Harp, Santa Clara, \$15,817; J. W. Terrell, Sacramento, \$16,892; J. W. Haltermann, Willows, \$16,251; M. A. Jenkins, Sacramento, \$15,467. Contract awarded to Bodenhamer Construction Co., Oakland, \$14,585.

HUMBOLDT AND DEL NORTE COUNTIES—Furnishing and stockpiling screenings various locations. Dist. I, Rt. 1. E. B. Bishop, Sacramento, \$12,255; Smith Bros. Co., Eureka, \$12,341; Hein Bros., Basalt Rock Co., Petaluma, \$12,728. Contract awarded to Hemstreet & Bell, Marysville, \$11,094.

IMPERIAL COUNTY—Between Holtville and East Highline Canal, 6.5 miles oil treated gravel borders. District VIII, Route 27, Section D. R. E. Hazard Contracting Co., San Diego, \$24,690; Griffith Company, Los Angeles, \$26,575. Contract awarded to V. R. Dennis Const. Co., San Diego, \$21,520.

IMPERIAL COUNTY—Between El Centro and Calexico, 10.1 miles to be surfaced with bituminous treated gravel. District VIII, Route 26, Section J. B. G. Carroll, San Diego, \$56,220; V. R. Dennis Const. Co., San Diego, \$62,100; Griffith Company, Los Angeles, \$48,034. Contract awarded to R. E. Hazard Contracting Co., San Diego, \$36,997.

INYO COUNTY—Between Bishop and Owens River Canal, 3.5 miles to be graded and surfaced with selected material and bituminous treatment. District IX, Route 23, Section E. Southwest Paving Co., Los Angeles, \$30,428; Hemstreet & Bell, Marysville, \$26,367. Contract awarded to Basich Bros., Torrance, \$25,627.25.

KERN COUNTY—Between westerly boundary and 2.4 miles south of Maricopa, 8.7 miles to be graded. Dist. VI, Rt. 57, Sec. A. Larsen Bros., Sacramento, \$160,831; Fredrickson & Watson, Oakland, \$152,700; J. L. Conner & Kristich, San Juan Capistrano, \$194,467; George K. Thompson, Los Angeles, \$149,498; J. E. Haddock, Pasadena, \$158,496; C. G. Willis & Sons, Chas. G. Willis & Crow Bros., Los Angeles, \$154,228; Griffith Company, Los Angeles, \$143,065; Sharp & Fellows Contracting Co., Los Angeles, \$140,654; Macco Construction Co., Clearwater, \$143,065; Basich Brothers & John Jurkovich, Torrance, \$155,331; Gist & Bell, Arcadia, \$169,102; M. J. Bevanda, \$137,932; Hemstreet & Bell, Marysville, \$151,495; Gogo & Rados, Los Angeles, \$159,359; C. W. Wood, Stockton, \$155,880; Von der Hellen & Pierson, Castaic, \$155,560. Contract awarded to J. F. Knapp, Oakland, \$133,773.

LOS ANGELES AND KERN COUNTIES—Between Lancaster and Mojave, about 24.4 miles of roadbed to be widened and about 11.2 miles of earth shoulders to be oil treated. District VII, Route 23, Sections G. A. J. E. Haddock, Pasadena, \$47,997; Geo. K. Thompson, Los Angeles, \$48,619; Griffith Co., Los Angeles, \$51,684; Tiffany Construction Co., San Jose, \$52,746. Contract awarded to Dimmitt & Taylor, Los Angeles, \$45,617.

LOS ANGELES COUNTY—Between Sunland and Tujunga, about 1.6 miles to be graded and paved with asphalt concrete. District VII, Route 9, Section A. Mundo Engineering Co., Los Angeles, \$95,418; Griffith Co., Los Angeles, \$87,557. Contract awarded to P. J. Akmadzich, Los Angeles, \$86,970.

LOS ANGELES COUNTY—14.5 miles of shoulders, gutters and dykes to be treated with heavy fuel oil. District VII, Route 4, Sections A, C, H, I. Match Bros. & Geo. Gardner & Sons, Elsinore, \$11,995; Alex. C. Chalmers & Max Winter, Jr., Los Angeles, \$12,237; Peter J. Akmadzich, Los Angeles, \$12,750; H. E. Cox & Son, Pasadena, \$14,587; Gogo & Rados,

Los Angeles, \$15,500. Contract awarded to Oilfields Truck Co., Bakersfield, \$11,240.

LOS ANGELES COUNTY—Between Foothill Boulevard and Alasta Avenue 0.6 mile graded and paved with asphalt concrete. District VII, Route 9, Section H. W. E. Hall Company, Alhambra, \$34,514; Griffith Company, Los Angeles, \$34,543; P. I. Akmadzich, Los Angeles, \$45,938. Contract awarded to Oswald Bros., Los Angeles, \$32,338.

MADERA COUNTY—Across Ash Slough near Chowchilla, timber bridge, thirty-four 19-ft. spans on pile bents. District VI, Route 4, Section C. Carl N. Swenson Co., San Jose, \$33,785; Neves and Harp, Santa Clara, \$37,876; J. P. Brennan, Redding, \$37,699; Lord & Bishop, Sacramento, \$37,447; J. F. Knapp, Oakland, \$35,240; M. B. McGowan, San Francisco, \$37,698; Stroud Bros. & Seabrook, Bakersfield, \$36,635; M. A. Jenkins, Sacramento, \$36,448. Contract awarded to F. O. Bohnett, Campbell, \$32,951.

MARIN COUNTY—Construction of maintenance station buildings near San Rafael. District IV. San Francisco Construction Company, Inc., San Francisco, \$6,991; Thos. J. Doyle, San Francisco, \$6,877. Contract awarded to Albert H. Seimer, San Anselmo, \$6,437.

MENDOCINO COUNTY—Bridge across Feliz Creek at Hopland, consisting of nine 38-ft. steel stringer spans with concrete deck on concrete pile bents. District IV, Route 1, Section L. M. B. McGowan, San Francisco, \$27,291; Lindgren & Swinerton, San Francisco, \$31,600; L. C. Seidel, Oakland, \$33,835; Rocca & Caletti, San Rafael, \$33,692; J. P. Brennan, Redding, \$29,846; Chas. Kuppinger, Lakeport, \$28,742; Fredrickson & Watson, Oakland, \$31,895; Smith Bros. Co., Eureka, \$38,140; Barrett & Hill, San Francisco, \$32,369; F. J. Maurer & Son, Eureka, \$28,975; Mercer-Fraser Co., Eureka, \$33,614; J. F. Knapp, Oakland, \$31,142. Contract awarded to A. T. Howe, Santa Rosa, \$26,428.

MERCED COUNTY—Between N. boundary and Livingston, 6.2 miles bituminous surfacing. District VI, Route 4, Section D. Willard-Biasotti & Covotti, Stockton, \$29,213; Stewart & Nuss, Inc., Fresno, \$28,992; A. Teichert & Son, Inc., Sacramento, \$30,606; Tiffany Const. Co., San Jose, \$27,840; Valley Paving, Fresno, \$28,230. Contract awarded to Granite Const. Co., Watsonville, \$25,857.

MONO COUNTY—Between Sherwin Hill Summit and Whisky Canyon, 3.7 miles to be graded, surfaced with bituminous treatment. District IX, Route 23, Section B. Basich Brothers, Torrance, \$64,257; Kennedy Const. Co., Oakland, \$59,935; Larsen Bros., Sacramento, \$47,598; Southwest Paving Co., Los Angeles, \$61,715. Contract awarded to Hemstreet & Bell, Marysville, \$46,137.50.

MONTEREY COUNTY—Between Gonzales and Soledad, 7.2 miles of property fence constructed. Dist. V, Rt. 2, Secs. C, D. L. A. Brisco, Arroyo Grande, \$3,142; Walter B. Roselip, San Luis Obispo, \$3,523; Edward R. Jameson, Sacramento, \$3,035; Tieslau Bros., Berkeley, \$4,406; John Fester, Santa Maria, \$3,086; Charles W. Lane, \$3,541; A. J. Grier, Oakland, \$3,300. Contract awarded to Westcott's Plumbing and Electrical Co., Soledad, \$2,497.

MONTEREY COUNTY—Between King City and 2 miles south of Greenfield, about 8.9 miles to be graded and bituminous surface treatment applied. District V, Route 2, Sections F, E. Tiffany Construction Co., San Jose, \$123,886; Granite Construction Company, Ltd., Watsonville, \$117,514; T. C. Rogers, Inc., Los Angeles, \$144,280; Heafey-Moore Co., Oakland, \$117,859. Contract awarded to Jones & King, Hayward, \$103,897.

MONTEREY COUNTY—Between Carmel River and Carmel, 1.9 miles graded and oil treated. Dist. V, Rt. 56, Sec. H. Yglesias Bros., Inc., San Diego, \$75,221; Hemstreet & Bell, Marysville, \$61,288; M. J. Bevanda, Stockton, \$60,825; Chas. L. Harney, San Francisco, \$52,611; Tiffany Const. Co., San Jose, \$59,902; Kennedy Const. Co., Oakland, \$70,016; M. T. Murphy, Inc., Carmel, \$54,534. Contract awarded to J. L. Conner & K. Kristich, Monterey, \$48,962.

MONTEREY COUNTY—Timber bridge across Willow Creek, about 32 miles north of San Simeon, consisting of one 76-ft. truss span, two 57-ft. truss spans

Bids and Awards for November

(Continued from page 29)

and fifteen 19-ft. spans on frame bents. District V, Route 56, Section B. Stroud Bros. and Seabrook, Bakersfield, \$54,916; Neves & Harp, Santa Clara, \$44,438; M. B. McGowan, Inc., San Francisco, \$50,823; B. A. Howkins & Co., San Francisco, \$46,274; J. W. Terrell, Sacramento, \$44,909; Theo. M. Maino, San Luis Obispo, \$44,396; E. T. Lesure, Oakland, \$58,738. Contract awarded to Associated Constructors, Inc., Los Angeles, \$33,665.

MONTEREY COUNTY—Bridge across Carmel River, consisting of thirteen 40-ft. reinforced concrete girder spans. District V, Route 56, Section H. J. W. Terrell, Sacramento, \$42,936; V. Maggiora, Sausalito, \$42,881; Carl N. Swenson Co., San Jose, \$37,968; L. C. Seidel, Oakland, \$49,817; Sam Sciarrino, San Jose, \$37,162; M. B. McGowan, San Francisco, \$38,497; Rocca & Caletti, San Rafael, \$42,794. Contract awarded to Bodenhamer Const. Co., Oakland, \$36,939.

MONTEREY COUNTY—Between San Adro and King City 7.4 miles of bituminous surface treatment. District V, Route 2, Sections F, G. M. J. Bevanda, Stockton, \$40,175; Tiffany Const. Co., San Jose, \$32,127. Contract awarded to Granite Const. Co., Ltd., Watsonville, \$31,068.

NAPA COUNTY—Between E. Boundary and Napa Wye; Between Napa Wye and S. Boundary, 8.2 miles surfaced with bituminous gravel. District IV, Routes 8, 74, Sections B, A. Pacific States Const. Co., \$44,788; Granite Const. Co., Ltd., Watsonville, \$44,487; A. Teichert & Son, Inc., Sacramento, \$46,509; J. C. Compton, McMinnville, Oregon, \$42,054.

ORANGE AND LOS ANGELES COUNTIES—Various location oiling over 31 miles. District VII, Routes 2, 26, 60, Sections A, F, C; A, B, C. Dimmitt & Taylor, Los Angeles, \$28,321; Match Bros. & Geo. Gardner, Elsinore, \$25,146; C. W. Wood, Stockton, \$28,575. Contract awarded to Kovacevich & Price, Southgate, \$24,511.

ORANGE COUNTY—In Anaheim between Sycamore Street and Romneya Drive. 1 mile to be graded and paved with asphalt concrete. District VII, Route 2, Section E. P. J. Akmadich, Los Angeles, \$45,228; Gogo and Rados, Los Angeles, \$46,317. Contract awarded to Griffith Company, Los Angeles, \$41,801.

PLUMAS COUNTY—Bridge across N. fork of Feather River, consisting of one 130-ft. through steel arch span with concrete deck. District II, Route 21, Section B. H. Sneed, Berkeley, \$25,628; M. B. McGowan, San Francisco, \$27,698; Smith Bros., Eureka, \$25,003; Rocca & Caletti, San Rafael, \$24,106; Lord & Bishop, Sacramento, \$23,737; Paul M. White, Santa Monica, \$27,283; Baldwin & Butter, Berkeley, \$23,701. Contract awarded to Lynch-Cannon Engineering Co., Los Angeles, \$23,251.

RIVERSIDE COUNTY—Between Corona and Southern boundary, 41.6 miles to be treated with oil. District VIII, Route 77, Sections A, B, C, D. Clyde W. Wood, Stockton, \$41,682; Geo. K. Thompson, Los Angeles, \$45,950; Weymouth & Crowell Co., Los Angeles, \$43,584; Southwest Paving Co., Los Angeles, \$48,982; V. R. Dennis Const. Co., San Diego, \$43,626; Martin Bros. Trucking Co., Long Beach, \$49,618; E. L. Yeager, San Bernardino, \$55,152; Match Bros. & Geo. Gardner & Sons, Elsinore, \$40,214; United Concrete Pipe Corp., Los Angeles, \$45,414; P. J. Akmadich, Los Angeles, \$46,960. Contract awarded to Dimmitt & Taylor, Los Angeles, \$40,214.

RIVERSIDE COUNTY—District VIII, Routes 19, 78, Sections B, D, C. Weymouth & Crowell, Los Angeles, \$26,273; Southwest Paving Co., Los Angeles, \$29,785; E. L. Yeager, San Bernardino, \$33,247; Oilfields Trucking Co., Bakersfield, \$38,536; C. W. Wood, Stockton, \$25,127; United Concrete Pipe Corp., Los Angeles, \$26,734; P. J. Akmadich, Los Angeles, \$28,955; Dimmitt & Taylor, Los Angeles, \$25,782. Contract awarded to Match Bros. and Geo. Gardner & Sons, Elsinore, \$23,983.50.

RIVERSIDE COUNTY—District VIII, Routes 19, 78, Sections B, D, C. Weymouth & Crowell, Los Angeles, \$26,273; Southwest Paving Co., Los Angeles, \$29,785; E. L. Yeager, San Bernardino, \$33,247; Oilfields Trucking Co., Bakersfield, \$38,536; C. W. Wood, Stockton, \$25,127; United Concrete Pipe Corp., Los Angeles,

\$26,734; P. J. Akmadich, Los Angeles, \$28,955; Dimmitt & Taylor, Los Angeles, \$25,782. Contract awarded to Match Bros. and Geo. Gardner & Sons, Elsinore, \$23,983.50.

RIVERSIDE AND IMPERIAL COUNTIES—Between Avenue 62 and the Riverside-Imperial County line and between 3 miles and 10 miles south of co. line, 21.7 miles shoulder oiling. District VIII, Route 26, Sections G, D, E. Walter Trepte, San Diego, \$26,927; United Concrete Pipe Corp., Los Angeles, \$26,358; P. J. Akmadich, Los Angeles, \$25,270; Geo. K. Thompson, Los Angeles, \$27,477; Southwest Paving Co., Los Angeles, \$29,055; Clyde W. Wood, Stockton, \$23,856. Contract awarded to Match Bros. & Geo. Gardner & Son, Elsinore, \$21,994.

RIVERSIDE COUNTY—Between 4 miles east of Mecca and Shavers Summit, 19.6 miles to be treated with fuel oil. District XI, Route 64, Sections A, B. A. Teichert and Son, Inc., Sacramento, \$29,670; Match Bros. & Geo. Gardner & Sons, Elsinore, \$22,941; E. L. Yeager, San Bernardino, \$27,789; Gogo & Rados, Los Angeles, \$26,677; Walter Trepte, San Diego, \$26,677; Oilfields Trucking Co., Bakersfield, \$29,952. Contract awarded to Clyde W. Wood, Stockton, \$16,545.

SACRAMENTO COUNTY—Between Citrus and Salsbury, an irrigation ditch about 0.7 mile in length to be excavated and lined with gunite. District III, Route 11, Section B. Case Construction Company, Inc., Los Angeles, \$13,562; D. McDonald, Sacramento, \$12,805. Contract awarded to J. W. Hoopes, Sacramento, \$11,265.

SACRAMENTO COUNTY—Between Sacramento and McConnell, widening 8 reinforced concrete slab bridges and 1 culvert from 24-ft. to 34-ft. width. District X, Route 4, Section B. J. W. Hoopes, Sacramento, \$16,695; The Valley Const. Co., Modesto, \$18,047; Geo. G. Pollock, Sacramento, \$23,687; Lord & Bishop, Sacramento, \$18,230; P. F. Bender, Sacramento, \$20,695; Holdener Const. Co., Sacramento, \$22,527. Contract awarded to M. A. Jenkins, Sacramento, \$14,964.75.

SACRAMENTO COUNTY—Constructing addition to the headquarters shop building in Sacramento. C. J. Hopkinson, Sacramento, \$17,869; P. F. Bender, North Sacramento, \$18,795; Holdener Const. Co., Sacramento, \$18,200; Azevedo-Sarmiento, Sacramento, \$18,200; Theodor Johanns, San Francisco, \$18,998. Contract awarded to Leo Epp, San Francisco, \$16,770.

SAN BERNARDINO COUNTY—Between Camp Waterman and Arrowhead Springs 4.5 miles bituminous surface treatment applied. Dist. VIII, Rt. 43, Sec. A. E. L. Yeager, San Bernardino, \$3,309; L. A. Paving Co., Los Angeles, \$3,560; C. V. Sparks, Los Angeles, \$3,820; H. E. Cox & Son, Pasadena, \$3,397. Contract awarded to G. Gardner & Sons, Redlands, \$2,970.

SAN BERNARDINO COUNTY—In San Bernardino between west city limits and Mount Vernon Avenue, about 0.4 mile to be graded and paved with Portland cement concrete. District VIII, Route 9, Section C. Match Bros., Elsinore, \$25,884; E. L. Yeager, San Bernardino, \$25,289; J. E. Haddock, Ltd., Pasadena, \$24,082. Contract awarded to United Concrete Pipe Corporation, Los Angeles, \$23,884.

SAN BERNARDINO COUNTY—Between Arrowhead Springs and San Bernardino, 0.8 mile grading, surfacing with oil treated gravel. Dist. VIII, Rt. 43, Sec. A. George Herz & Co., San Bernardino, \$34,503; C. O. Sparks, Los Angeles, \$35,344; Kuhn Bros., Inc., Manhattan Beach, \$38,152. Contract awarded to United Concrete Pipe Corp., Los Angeles, \$32,123.

SAN BERNARDINO COUNTY—At Mt. Vernon Avenue Crossing in San Bernardino about 0.2 mile to be graded and paved with Portland cement concrete. District VIII, Route 9, Section C. E. L. Yeager, San Bernardino, \$23,431; George Herz Co., San Bernardino, \$27,353. Contract awarded to United Concrete Pipe Corp., Los Angeles, \$26,926.

SAN DIEGO COUNTY—Between Oceanside and Carlsbad, 2 reinforced concrete girder bridges to be widened. Dist. XI, Rt. 2, Sec. B. Miracle Company, San Diego, \$19,351; Byrns & Dunn, Los Angeles, \$18,162. Contract awarded to Contracting Engineers, Los Angeles, \$12,743.

(Continued on page 32)

An Appeal for Unemployment Relief

Urging compliance with the conditions of the National Recovery Act and stressing the ardent desire of Governor James Rolph, Jr., to give work to as many as possible of the unemployed citizens of the State who have families dependent on them, Director Earl Lee Kelly sends the following letter to every contractor who is awarded a contract for State highway work:

Gentlemen:

It is a pleasure, indeed, to enclose your contract for highway work which has been awarded to you.

As you well know, Governor Rolph's administration has had, since its inception, the prime objective of giving relief to the unemployed, especially those with dependents.

Now, with the National Recovery Act in effect, and with the plea of President Franklin Delano Roosevelt before us that we should shorten hours and, wherever possible, increase pay, I write urging upon you the necessity of falling in line with this nation-wide movement to the end that the economic recovery of the Nation and of this State may be hastened.

The Department of Public Works itself has initiated the five-day week among its day labor men without corresponding decrease in pay and with the employment of additional men.

If every contractor securing State work through this department cooperates with the National Recovery Act, he must and will benefit materially. That cooperation I now ask of you.

With kindest personal regards and best wishes, I am

Sincerely yours,

EARL LEE KELLY,
Director of Public Works.

GOLD RUN-AIRPORT CUT-OFF COMPLETED, OPEN TO TRAFFIC

The improvement of an important section of the Victory Highway between Gold Run and Airport in Placer County has just been completed eliminating 13.5 miles of narrow, crooked highway and grades.

Construction has been under way for two years involving grading and surfacing of 11.5 miles that included excavation of 838,026 cubic yards and the placing of 49,000 tons of crusher run base and 23,000 tons of bituminous treated surfacing, 10,000 lineal feet of laminated timber guard rail, 1034 timber guide posts, and 294 culvert markers. The total cost was \$572,168. C. H. Whitmore was District Engineer with J. G. Meyer as Resident Engineer.

CONTRACT AWARDED FOR ANOTHER BAY SHORE LINK

The Bay Shore Highway is being advanced towards San Jose with the award of contract for the construction of another section of modern highway. This new portion will carry the wide boulevard, which extends down the peninsula from San Francisco, from Lawrence Station Road to the Alviso-Santa Clara Road.

On the Redding-Alturas lateral one of the last unimproved sections is to be brought to modern standards by the construction of a graded roadbed and placing of a bituminous treated surface between Diddy Hill and Montgomery Creek, in Shasta County.

A contract has recently been awarded for construction of the portion from Redding to Bella Vista.

Bids and Awards for November

(Continued from page 30)

SAN JOAQUIN COUNTY—Between Lodi and 4½ miles east, about 4.5 miles to be graded and surfaced with crushed gravel or stone bituminous treated. District X, Route 24, Section E. A. Teichert & Son, Inc., Sacramento, \$87,908; Blasotti, Willard & Blasotti, Stockton, \$77,886; Heafey-Moore Co., Oakland, \$78,888; Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$83,047; Granite Construction Company, Ltd., Watsonville, \$82,523; Hanrahan Co., San Francisco, \$92,875; Eaton & Smith and A. J. Grier, San Francisco, \$94,018; M. J. Bevanda, Stockton, \$93,989. Contract awarded to Tiffany Construction Co., San Jose, \$76,851.

SAN LUIS OBISPO COUNTY—Widening a bridge at the south city limits of San Luis Obispo. District V, Route 2, Section E. J. J. Mannermann Co., Santa Barbara, \$1,461; Chas. W. Lane, Paso Robles, \$1,282; Walter B. Roselip, San Luis Obispo, \$1,498. Contract awarded to Theo. M. Maino, San Luis Obispo, \$1,248.

SAN LUIS OBISPO, MONTEREY AND SAN BENITO COUNTIES—17.2 miles of shoulders oiled. District V, Routes 2 and 22, Sections D, I, A, A, B. M. J. Bevanda, Stockton, \$22,163; Granite Construction Co., Watsonville, \$21,344; Tiffany Construction Co., San Jose, \$21,329; Oilfields Trucking Co., Bakersfield, \$31,486. Contract awarded to L. A. Brisco, Arroyo Grande, \$20,682.05.

SANTA BARBARA COUNTY—Between Olive Mill Road and Santa Barbara, 0.8 mile grading, paving with asphalt concrete. Dist. V, Rt. 2, Sec. J. United Concrete Pipe Corp., Los Angeles, \$53,123; Griffith Company, Los Angeles, \$43,627; Western Motor Transfer, Santa Barbara, \$45,657. Contract awarded to P. J. Akmadzich, Los Angeles, \$36,725.

SANTA CLARA COUNTY—Between Lawrence Station Road and Alviso-Santa Clara Road, about 2.7 miles to be graded and paved with Portland cement concrete. District IV, Route 68, Section B. Heafey-Moore Co., Oakland, \$238,559; Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$238,860; A. J. Raisch Co., San Jose, \$223,518; Hanrahan Co., San Francisco, \$222,206; Peninsula Paving Co., San Francisco, \$229,342. Contract awarded to Basich Bros., Torrance, \$213,461.

SISKIYOU COUNTY—At Big Canyon, 0.8 mile line change grading surfacing bituminous treated. District II, Route 3, Section A. George Pollock, Sacramento, \$68,590; Dunn & Baker, Klamath Falls, Oregon, \$75,885; A. Young, Yreka, \$89,923; Union Paving Co., San Francisco, \$74,067; D. McDonald, Sacramento, \$73,757; Contoules Const. Co., San Francisco, \$69,541; Fredrickson & Watson Const. Co., Oakland, \$67,584; Isbell Const. Co., Carson City, Nevada, \$77,887; Young & Son, Berkeley, \$64,878; M. J. Bevanda, Stockton, \$77,230; Kennedy Const. Co., Oakland, \$85,696. Contract awarded to A. Teichert & Son, Inc., Sacramento, \$59,457.

SONOMA COUNTY—Between Fairville and Shellville, 0.9 mile to be graded and surfaced with crusher run base and bituminous treated crushed gravel. District IV, Route 8, Section A. A. Teichert & Son, Inc., Sacramento, \$73,407; Central States Contracting Co., Oakland, \$67,167; D. McDonald, Sacramento, \$87,650; Hanrahan Company, San Francisco, \$93,456; Clyde W. Wood, Stockton, \$64,414. Contract awarded to Peninsula Paving Co., San Francisco, \$63,021.

SONOMA COUNTY—Bridge across Russian River at Preston, one 150-ft. through steel truss span, two 38-ft. steel beam spans and three 37-ft. steel beam spans. District IV, Route 1, Section D. Barrett & Hilp, San Francisco, \$75,135; Neves Harp, Santa Clara, \$72,932; Rocca & Caletti, San Rafael, \$74,111; J. F. Knapp, Oakland, \$68,247. Contract awarded to M. B. McGowan, San Francisco, \$67,793.

VENTURA COUNTY—Bridge across Calleguas Creek, 8 miles south of Oxnard, consisting of eight 30-foot reinforced concrete girder spans on concrete pile bents. District VII, Route 60, Section A. Oscar Oberg, Los Angeles, \$36,477; R. R. Bishop, Long Beach, \$37,400; Clinton Construction Co., Los Angeles, \$35,237; C. Bongiovanni Const. Co., Hollywood, \$35,186; Sharp & Fellows, Los Angeles, \$37,962; Eyerts & Dunn, Los Angeles, \$33,541; M. B. McGowan, San Francisco, \$37,149; Dimmitt and Taylor, \$34,303;

United Concrete Pipe Corp., Los Angeles, \$34,901; Neves & Harp, Santa Clara, \$33,963; Contract awarded to Constructors, Inc., Los Angeles, \$26,851.

VENTURA AND LOS ANGELES COUNTIES—Between Ventura and Castaic, 40.3 miles of bituminous seal coating to be applied to existing shoulders. District VII, Route 79, Sections A, B, C, A. M. J. Bevanda, Stockton, \$25,692; Griffith Company, Los Angeles, \$20,564; P. J. Akmadzich, Los Angeles, \$25,561; Kemper Const. Co., Ltd., Los Angeles, \$21,747; Geo. K. Thompson, Los Angeles, \$23,216; Contract awarded to Matich Bros. & Geo. Gardner & Sons, Elsinore, \$19,916.60.

VENTURA COUNTY—Between W. limits of Ventura and Sanjon Road, 1.6 miles Portland cement pavement widening. District VII, Route 2, Section C. Gibbens & Reed Co., Burbank, \$36,886; United Concrete Pipe Corporation, Los Angeles, \$33,895; P. J. Akmadzich, Los Angeles, \$35,177; Weymouth Crowell Co., Los Angeles, \$36,289; Griffith Company, Los Angeles, \$32,121; T. C. Rogers, Los Angeles, \$37,127; M. J. Bevanda, Stockton, \$40,110. Contract awarded to Kovacevich & Price, Southgate, \$30,454.

YOLO AND BUTTE COUNTIES—4 miles bituminous treatment applied between Davis Wye and Willow Slough, Route 7; Between 1 mile north of Rock Creek and 1 mile south of Pine Creek, Route 3, District III; Routes 7 and 3, Sections A, D. Granite Const. Co., Watsonville, \$37,581; Clyde W. Wood, Stockton, \$36,908; J. C. Compton, McMinnville, Oregon, \$37,055; Tiffany Const. Co., San Jose, \$36,894; A. Teichert & Son, Sacramento, \$40,285; Pacific Truck Service Corp., San Jose, \$36,420. Contract awarded to E. A. Forde, San Anselmo, \$35,851.

YOLO COUNTY—Between Rumsey and the northerly boundary, about 3.7 miles to be graded. District III, Route 50, Section A. Central States Construction Co., Oakland, \$191,429; Bechtel Kaiser Company, Ltd., San Francisco \$186,334; Fredrickson & Watson Construction Co., and Fredrickson Bros., Oakland, \$148,509; Von der Hellen & Pierson, Castaic, \$151,408; Hemstreet & Bell, Marysville, \$149,185. Contract awarded to Young & Son Company, Ltd., Berkeley, \$140,708.

YUBA COUNTY—Between Wheatland and Morrison Crossing, 2.5 miles grading, paving with asphalt concrete. District III, Route 3, Sections A, B. Basich Brothers, Torrance, \$85,952; A. Teichert & Son, Sacramento, \$92,056; Tiffany Const. Co., San Jose, \$88,992; Hanrahan Co., San Francisco, \$84,836; Hemstreet & Bell, Marysville, \$91,837. Contract awarded to A. J. Raisch, San Francisco, \$81,753.

DISTRICT BID AWARDS

IMPERIAL COUNTY—Between Araz and the Colorado River, 6 miles earth shoulders to be treated with fuel oil. District VIII, Route 27, Section B. Matich Bros. & Geo. Gardner & Sons, Elsinore, \$6,381; Weymouth-Crowell Co., Los Angeles, \$7,823; Alex D. Chalmer & Max Winter, Jr., Los Angeles, \$7,243. Contract awarded to V. R. Dennis Const. Co., San Diego, \$5,576.

LOS ANGELES COUNTY—Near Beverly Boulevard, 0.08 mile slope protection. District VII, Route 60, Section B. Carl Hallin, Los Angeles, \$4,628; F. E. Aldous, Beverly Hills, \$5,488; F. B. Gridley, Pasadena, \$5,660; H. E. Cox & Son, Pasadena, \$5,736; Dimmitt & Taylor, Los Angeles, \$5,847; Maiser & Reed, Los Angeles, \$7,035; Oscar Oberg, Los Angeles, \$8,775. Contract awarded to P. R. Hughes, Long Beach, \$4,320.

SAN BERNARDINO COUNTY—Between Camp Waterman and Brunt Mill maintenance station, about 11.8 miles, bituminous surface treatment. District VIII, Route 43, Sections A, B. Matich Bros. & Geo. Gardner & Sons, Elsinore, \$9,760; George Herz & Co., San Bernardino, \$9,056. Contract awarded to E. L. Yeager, San Bernardino, \$8,755.

SONOMA COUNTY—Furnishing and applying bituminous surface treatment between Willow Brook and Haystack, 4.2 miles. District IV, Route 1, Section C. E. A. Forde, San Anselmo, \$5,040; Lee J. Immel, Berkeley, \$4,791; Pacific Truck Service, Inc., San Jose, \$4,578. Contract awarded to Helwig Const. Co., Sebastopol, \$4,510.

STATE OF CALIFORNIA

Department of Public Works

HEADQUARTERS: PUBLIC WORKS BUILDING, ELEVENTH AND P STS., SACRAMENTO

JAMES ROLPH, JR.-----Governor
EARL LEE KELLY-----Director
ERIC CULLENWARD-----Deputy Director
MORGAN KEATON-----Assistant Deputy Director

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CALIFORNIA HIGHWAY COMMISSION

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PHILIP A. STANTON, Anaheim
FRANK A. TETLEY, Riverside
DR. W. W. BARHAM, Yreka
C. H. PURCELL, State Highway Engineer, Sacramento
JOHN W. HOWE, Secretary

HEADQUARTERS STAFF, SACRAMENTO

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J. G. STANDLEY (Acting), Principal Assistant Engineer
R. H. WILSON (Acting), Office Engineer
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FRED J. GRUMM, Engineer of Surveys and Plans
C. S. POPE, Construction Engineer
T. H. DENNIS, Maintenance Engineer
F. W. PANHORST, Acting Bridge Engineer
L. V. CAMPBELL, Engineer of City and Cooperative Projects
R. H. STALNAKER, Equipment Engineer
E. R. HIGGINS, Comptroller

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F. W. HASELWOOD, District II, Redding
CHARLES H. WHITMORE, District III, Marysville
J. H. SKEGGS, District IV, San Francisco
L. H. GIBSON, District V, San Luis Obispo
R. M. GILLIS (Acting), District VI, Fresno
S. V. CORTELYOU, District VII, Los Angeles
E. Q. SULLIVAN, District VIII, San Bernardino
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R. E. PIERCE, District X, Stockton
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A. D. EDMONSTON, Deputy in Charge Water Resources Investigation
R. L. JONES, Deputy in Charge Flood Control and Reclamation
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HUGH K. McKEVITT, Attorney, San Francisco
FRANK B. DURKEE, General Right of Way Agent
C. R. MONTGOMERY, General Right of Way Agent

DIVISION OF PORTS

Port of Eureka—William Clark, Sr., Surveyor
Port of San Jose—Not appointed

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

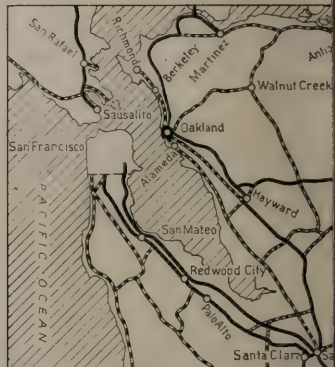
MAP
SHOWING
STATE HIGHWAY SYSTEM

1933

LEGEND
Primary Roads 
Secondary Roads 



See Detail Map



SAN FRANCISCO AND VICINITY



LOS ANGELES AND VICINITY

WATER 1933 JANUARY

